“Keeping on top of it”: how livestock farmers manage their workloads and the demands of farm assurance

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Abstract

This study explores how livestock farmers in the UK are managing their workloads and the need to comply with sustainability standards, at a time when farm workforces are constrained by financial pressures and labour shortages. Whereas the labour implications of agri-environment schemes have been expertly studied, there has been less research on private-sector farm assurance schemes. Using a mixed-methods approach, the study combines analysis of scheme documents, data from the English Farm Business Survey, a postal survey of 230 farms and telephone interviews with 34 farmers, focusing on businesses with cattle or sheep in the English counties of Herefordshire, Shropshire and Wiltshire. The study identifies an increase in operational demands that farms must comply with to qualify for grant payments, remain certified and access markets. Livestock farms also face demands for increasingly sophisticated measures of record-keeping, planning and monitoring which require IT literacy and an experimental approach. To date the greatest burden has fallen on dairy farms, but the requirements for beef and lamb producers are growing. The study uses theories of farm resilience to conceptualise how farms accommodate the demands of farm assurance and other labour pressures. It finds that most livestock farms have the capacity to stretch their labour force, which helps them to cope with fluctuating workloads. Livestock farms are also adept at postponing non-urgent tasks and adjusting their production systems to bring their workloads in balance with their available labour. However, the study identified farms whose labour systems were under strain. Going forward, livestock farms must confront a widening range of external requirements in order to fulfil agri-environment demands of the state, meet the sustainability commitments of mainstream buyers or pursue alternative marketing channels. The study finds that if they are to fully implement these requirements and avoid becoming over-stretched, many livestock farms will need to find ways to afford and access additional help. Already, the financial and labour costs of compliance were prompting some sheep farmers in the study to consider dropping out of the Red Tractor scheme. The study contributes to research on farm-level resilience and change by paying close attention to how such labour issues affect farm decisions.

Declaration: I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Rebecca Smalley

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Glossary and acronyms

AES	agri-environment scheme
AHDB	Agriculture and Horticulture Development Board
AWU	Annual Work Unit
BPS	Basic Payment Scheme
BVD	bovine viral diarrhoea
CHECS	Cattle Health Certification Standards
connectedness	Describes the extent to which a farm has a diverse farm business, has a large workforce made up of diverse labour sources and/or participates in several requirement schemes and/or marketing channels.
core workforce	All full-time and part-time members of the farm *workforce*.
Defra	Department for Environment, Food and Rural Affairs
eco-extensive	A farm whose production system is certified as extensive and agro-ecological (e.g. organic certification, Pasture For Life, Free Range Dairy).
ELM	Environmental Land Management
enterprise	A distinct farming or non-farming enterprise within a farm business.
external workforce	Agricultural contractors and other farmers who contributed labour-input to the farm business in the previous 12 months.
farm labour system	The arrangement of labour associated with a farm business, operationalised by the farm workforce.
FAWL	Farm Assured Welsh Livestock
FEC	faecal egg count
FSA	Food Standards Agency
FTE	Full Time Equivalent
grazier	A person who operates a grazing business, where the grazier's cattle or sheep are grazed on someone else's land. Might own little or no land.
IBR	infectious bovine rhinotracheitis
intensive rotational grazing	A grazing regime that uses techniques such as strip grazing and mob grazing to stock an area of pasture at high density for a short period of time before the animals are moved on, leaving the pasture for a long period of recovery.
internal workforce	*Core* and *peripheral* members of the farm *workforce*.

KPI	key performance indicator
LFA farm	*LFA* grazing livestock farm.
LFA	Less Favoured Area. Upland which has been formally designated as an area of challenging farming conditions.
livestock farm	A farm that keeps cattle and/or sheep.
lowland farm	Lowland grazing livestock farm.
PCHS	Premium Cattle Health Scheme
peripheral workforce	All casual and seasonal members of the farm *workforce*.
personal flexibility	Where workers are willing and able to work long hours when needed and where their hours of work can be easily changed.
PFLA	Pasture Fed Livestock Association
RABI	Royal Agricultural Benevolent Institution
requirement scheme	A set of requirements that farmers must comply with to the satisfaction of an external body that imposes the requirements. Includes farm assurance and other third-party certification schemes, agri-environment schemes and Cross Compliance.
resilience	The capacity to absorb pressures, adapt or change.
RPA	Rural Payments Agency
RUMA	Responsible Use of Medicines in Agriculture
SLR	Standard Labour Requirement
smallholding	A farm or grazier businesses under 20ha and which does not participate in a requirement scheme or sell to a supermarket, processor or cooperative.
stretched	Describes a farm labour system that is not easily managing the farm workload. A farm labour system is overly stretched when members of a farm workforce, collectively, are not able to fully manage the workload without working very long hours, are not able get things done despite working long hours or find it difficult or stressful to execute the workload.
TB	tuberculosis (bovine)
VAT	Value Added Tax
workforce	All those who contributed labour-input to the farm business in the previous 12 months, comprising the *internal* and *external* workforce. Can also refer to the total amount of labour-input.

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1. Introduction

Livestock farming in the UK is facing multiple challenges. Dairy, beef and sheep farms are all struggling to prove their economic, social and environmental sustainability, to use the framing of Sutherland et al. (2015). There are long-standing concerns over the low incomes of UK livestock farmers, particularly in the uplands (UK Parliament, 2010; Short & Dwyer, 2012; NFU, n.d.). The deterioration in the terms of trade in agriculture in the past 30 years has created a cost–price squeeze on farms (Lobley & Potter, 2004; Winter & Lobley, 2016). In 2018/19, the average commercial grazing livestock farm in England had negative income from agriculture and would have made a loss without Basic Payment support. Even on more profitable dairy farms, the Basic Payment accounted for 39% of total farm business income (RBR, 2021). The Basic Payment is being phased out, and although the Department for Environment, Food and Rural Affairs (Defra) has stated that the forthcoming Environmental Land Management (ELM) scheme will provide payments to help offset this (Defra, 2018a), a serious and worrying income shortfall appears inevitable (Aglionby, 2020). There is further concern over the potential effects on UK beef and lamb producers of new export tariffs and import quotas in post-Brexit trade deals (Clark & Scanlon, 2019; Hybu Cig Cymru, 2021; Swales, 2021).

To exacerbate low farmgate prices and high input costs, some upland cattle and sheep farms have found it difficult because of their remote location to develop diversification businesses and off-farm income sources to supplement the low returns from farming (Morris et al., 2017b). Dairy enterprises have been under severe pressure in past years because of low and volatile milk prices, and hundreds have gone out of business (Maye et al., 2018b). The number of dairy holdings in England fell by 38% between 2008 and 2018, the largest decline of any agricultural sub-sector. By comparison, the number of grazing livestock and mixed holdings increased during the same period; some were former dairy holdings (Defra, 2020a).

While finding a way to survive financially, these farms must also meet calls to improve their environmental and ethical sustainability. Campaigns such as Veganuary, when consumers are encouraged not to eat animal products for a month, and the growth of plant-based milk alternatives such as oat and soya milk (Sustain, 2021) are indications that public views on livestock farming and its products are changing. Long valued for its contribution to England's pastoral landscapes, the UK's livestock farming community now faces critical questions over animal welfare and its environmental footprint (Schader et al., 2015; Garnett et al. 2017; Houses of Parliament, 2019). Calls for some upland pasture to be rewilded have received mainstream media attention, while substantial reports such as the EAT-Lancet report have called for the world's food system to shift towards plant-based foods (Willett et al., 2019). Researchers recently calculated that UK sheep farmers would become profitable if they stopped farming pasture land, allowed it to regenerate as deciduous forest and claimed payments for the ensuing carbon dioxide sequestration (O'Neill et al., 2020).

It is partly public concern over the environmental and ethical sustainability of livestock farming that has driven the growth of farm assurance and certification schemes in recent years (Pelletier, 2016; Oya et al., 2017). Through third-party labelling and audit schemes such as Red Tractor and the individual sourcing policies of buyers in the supply chain, livestock farmers are being asked to show that their farming practices meet minimum standards in a wide range of areas concerning environmental sustainability and animal welfare. They already face multiple statutory requirements on issues as diverse as nitrate pollution, food safety and bovine tuberculosis (TB). Demonstrating compliance entails paperwork and inspection for participating farmers.

Observing these trends led this researcher to wonder about the labour demands of measures that farmers are asked to comply with in the name of sustainability, animal welfare and food traceability. There has not been much public discourse on this point, but in 2014, a representative of the National Farmers Union responded to the introduction of stricter standards on animal welfare in Red Tractor schemes by arguing that if such improvements were adding to the value of farm produce, this should be passed by retailers to the producers (Cooper, 2014) – implying that farmers should be financially compensated for the additional work they were being asked to do.

This links to a third set of challenges facing UK livestock farming, which relate to the working environment. That farming has become a lonely and stressful profession for many is well documented (Saxby et al., 2018), and concerns have been raised over the potential for bureaucracy to contribute to poor mental health in the sector (Kirwans, 2018; Hostiou et al., 2020). Through research in neighbouring Ireland, Robinson (2017) found that paperwork, cost pressures and TB regulations were contributing to high levels of stress and feelings of despair among cattle farmers. If farmers are being asked to adopt sustainable farming practices that require additional time, it raises the question of where they find that labour. Cost pressures and sectoral restructuring have led to farms having much smaller workforces now than in the past. In addition, certain sectors of agriculture including dairy farming have been experiencing difficulties hiring workers (RABDF, 2017). A researcher interviewed livestock farmers in south-east Wales about how their livelihoods had changed over the years. He observed: "While the physical nature of farmwork has got easier, it is now more stressful, less sociable and if anything seems like it takes up more time" (Elster Jones, 2015:22). It has been argued that ageing, lone working and the need to cut corners, financially, are compromising the health and safety of farmworkers, with the rate of fatal farm accidents having increased in recent years (Worsfold, 2018; Cutress, 2021; Tasker, 2021).

This thesis presents the findings from a three-year study devoted to these questions of labour and external requirements. Focusing on livestock farming is valid because it represents such a large part of agriculture. In 2018, England had 52,489 agricultural holdings classified as dairy or grazing livestock holdings, according to the June Survey of Agriculture and Horticulture, henceforth known as the June Survey (Defra, 2019d). Together they accounted for 50% of all holdings and 39% of England's total farmed area. There were an additional 8,607 mixed holdings (representing 8% of all holdings and 10% of the farmed area). It is not reported how many of those had cattle and sheep, but the Farm Business Survey projected that England had 6,003 mixed farm businesses in 2018/19, of which 78% had cattle and 48% had sheep (RBR, 2021).

The objective of the study is to understand how livestock farmers manage their workloads and to what extent sustainability schemes and other external requirements are adding to them. The study takes a farmer-centric perspective, with a focus on livestock farms in three counties in England. It addresses the following Research Questions:

1. What do the experiences of farmers in Herefordshire, Shropshire and Wiltshire tell us about the changing nature of work and labour systems in UK livestock farming today?
    a. What are the labour patterns of livestock production and marketing systems?
    b. How, if at all, are changes to production systems, farm businesses and routes to market affecting the nature of farmwork?
    c. How, if at all, are human resource needs and employment patterns changing on livestock farms?
2. What are the specific effects of external requirements, especially farmer requirement schemes, on workloads and the nature of farmwork?
3. How are livestock farmers allocating time and sourcing labour to manage their workloads?
    a. How stretched are livestock farm labour systems?
    b. Is there elasticity in farm labour systems to cope with changes in workloads and the nature of work?
    c. Is there a threshold or breaking point, which triggers farmers to respond to work-related pressures in a drastic way? Do external requirements ever lead to a trigger event?
    d. Are labour shortages hindering responses to changes in workloads and the nature of work?
4. Which farmers are best or worst equipped to meet the changing nature of work and emerging labour needs in livestock farming?

The thesis is structured as follows. Findings from a literature review are presented in Chapter 2, which paves the way for presentation of the study design and research methodology in Chapter 3 and the study's conceptual framework in Chapter 4. The study includes analysis of secondary and primary data. The results from the secondary data analysis are given in Chapters 5–6, comprising an analysis of farmer requirement schemes (Chapter 5) and findings from the national Farm Business Survey data (Chapter 6). Chapters 7–10 cover findings from the primary data, presenting description and analysis of information gleaned from a questionnaire survey and farmer interviews. Chapter 11 contains two case studies which ask how the study findings could relate to future agricultural policy in the UK. Conclusions are drawn in Chapter 12.

General note: All figures and tables in this thesis were created by the author unless otherwise stated. Sources of data that were used to create figures and tables are provided for each one.

2. Background review of the literature

This chapter presents findings from a review of the academic and grey literature on aspects that are relevant to the study, setting the scene for the research to come. It begins with an overview of farmer requirement schemes and market networks in section 2.1. This leads to a review of research on how those schemes and routes to market affect farm labour, in section 2.2. Section 2.3 provides an empirical overview of labour in UK agriculture, while section 2.4 presents some key theories for understanding farm labour and especially theories of flexibility and under-employment in farming.

2.1 Requirement schemes and market networks

2.1.1 Overview of external requirements in farming

Farmers in the UK face a range of requirements concerning how they farm and run their farming operations. Some of the requirements are legal and statutory, some are voluntary, and some are stipulated by buyers. It has been suggested that external requirements have become more complex and more onerous over time (Oglethorpe & Heron, 2013).

At the very minimum, farm owners, farm tenants and agricultural contractors must follow laws in areas including waste management, animal disease and dead livestock, use of fertilisers and pesticides, and food safety, including control over Maximum Residue Levels (European Commission, 2018). Other laws cover Value Added Tax (VAT) and land matters such as land registration and agricultural tenancies. There are also laws on employment and public welfare.

Farmers who choose to receive direct subsidies from the state through the Basic Payment Scheme (BPS) must meet a set of Cross-Compliance requirements relating to food safety, livestock welfare and disease control, and environmental protection.

Another layer is a range of voluntary initiatives which involve a set of requirements that farmers may choose to comply with in return for receiving additional government payments or a potential price premium. This category includes voluntary agri-environment schemes (AES) such as Countryside Stewardship and nationally recognised organic certification. Organic certification overlaps with private certification schemes discussed below (Henson & Humphrey, 2010).

The final main source of requirements on farmers is the private sector. This comprises two main types: private assurance schemes, whereby farmers obtain a certificate or some other record of verification for complying with a set of standards; and buyers' individual requirements, whereby farmers must comply with a set of farming practices laid down by a direct or indirect corporate customer. This is one of the most complex and least transparent areas of external requirements and is explored in more depth in the next section.

Where several requirements are presented in a set for farmers to comply with, it is henceforth referred as a *requirement scheme*. These are described in more detail in Chapter 5.

2.1.2 Private-sector schemes

Market buyers make demands on farmers in two ways. Expectations on product quality, volumes and timings are largely covered in individual contracts, purchasing agreements and product specifications. But there is a second set of requirements that relate more to food safety, environmental sustainability, animal welfare and workers' rights, and these are typically covered by separate requirements. Buyers may either enforce those requirements through their own efforts, or obtain assurance that producers are meeting the requirements through an independent third-party assurance scheme. Requirements are typically compiled into a standard. Buyers and assurance providers may take a risk-based approach to decide if producers need to be audited against the standard and, if so, how often (Proforest, 2017).

Voluntary sustainability standards have been developed for global agricultural commodities such as coffee, cocoa and palm oil, as well as high-value exported produce such as fresh vegetables (KPMG, 2013; Ceres, 2017; Minten et al., 2017; Oya et al., 2017). In Europe, the most important influence on the development of private-sector schemes has been a concern with food safety (Soon & Baines, 2013). A number of food scares in the 1990s led to legislation such as the 1990 UK Food Safety Act and the 2005 EU General Food Law. These introduced the legal expectation for food retailers to undertake due diligence to ensure that food sold in their stores is safe and traceable to origin (Muirhead, 2015; Global Food Safety Initiative, 2018). The retail industry responded by developing standards for ensuring food safety in agriculture, such as GlobalGAP and the British Assured Food Standards, now known as Red Tractor (Corsin et al., 2007). Owing to the 1990s BSE crisis, the meat supply chain was one of the first sectors in the UK to undergo this change (Hobbs et al., 2002). Buyers began to require their farm and processor suppliers to obtain certification against the new standards, which are often referred to as 'farm assurance'. The emergence of such schemes was popular with European governments, which recognised that the schemes would reduce the cost of state inspections on farms (Garcia Martinez et al., 2013; Greenstreet Berman, 2013).

Private-sector schemes have also emerged, or been expanded, to address concerns over the environmental impacts of agriculture. Farmland biodiversity, impacts of pesticides and fertilisers, water use, soil conservation, genetically modified organisms and, more recently, the carbon footprint of farming are some of the key issues. Some of these schemes are farmer-driven, and have a long history. For example, the UK's LEAF Marque assurance scheme was developed in 1991 by farmers as a certifiable set of standards aimed at landscape and nature conservation, soil management and fertility, and other sustainability goals (Reed et al., 2017). Organic farming standards originated among progressive farmers in the 1920s (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012).

Schemes such as Red Tractor and LEAF are known as third-party schemes, since they are developed and administered by a neutral certification body (third party). In addition, some of the largest retailers, manufacturers and traders now require farmers to comply with each company's own set of standards (SHAFFE, 2009). UK farmers who follow private-sector requirements must do so in addition to legal and Cross-Compliance rules, and any AES that they are participating in. To some extent, companies have taken steps to minimise the duplication and audit fatigue among farmers that this can create. Marks and Spencer revised its M&S Select Grower assurance scheme in 2015 to reduce overlap with LEAF Marque and other schemes (Marks and Spencer, 2018). In 2017, it was decided that Tesco's Nurture scheme for fruit and vegetable producers would be recognised as equivalent to both Red Tractor and GlobalGAP (Pullman, 2017). There have been wider efforts to reduce the regulatory and compliance burden on UK farmers, considering not only private-sector but also statutory requirements. One initiative is Earned Recognition, where farmers who have passed voluntary farm assurance standards are deemed low risk and may not need to receive an inspection from a state body such as the Food Standards Agency (FSA) or the Rural Payments Agency (RPA) (Defra, 2013; Defra, 2018b).

However, retailers and manufacturers are still keen to impose their own requirements, either to ensure compliance with their growing legal and corporate sustainability commitments or to create product differentiation or market leadership (Henson & Humphrey, 2010; Pelletier, 2016). For companies, imposing their own requirements enables them to target the precise sustainability and ethical issues that they have committed to at a corporate group level. But it also enables companies to more easily identify suppliers who are struggling to comply and who could be targeted through farmer support programmes. For example, the brewery firm AB InBev has a programme for barley suppliers whereby the company provides in-house agronomists and supports farmers to collect and share data. The company reports: "Our data showed some farmers in Mexico tend to over-apply fertilizer, which increases cost and has a negative impact on the environment. Our teams are working with farmers to optimize nitrogen use through targeted crop management trials and technology" (AB InBev, 2018).

There has been some critical analysis of the private-sector compliance framework. Henson and Humphrey (2010) describe food safety-based schemes as risk management strategies that retailers use to externalise the costs of food-safety governance. Some researchers have interpreted assurance schemes as a means for buyers to exert more control over their suppliers and to offload their legal food safety obligations (Bain et al., 2011; Soon & Baines, 2013; Muirhead, 2015). An example of this could be when the French retailer Carrefour launched the Carrefour

Quality Lines approach with the explicit goal of “gaining control of supply” for a premium range (Carrefour, 2018:18), whereby participating farmers must “use integrated pest control and crop rotation, and abstain from spreading sludge from waste treatment plants, using soil-less crop production and applying post-harvest chemical treatment on fruit and vegetables” (Carrefour, 2017:15).

Using institutional economics and transaction cost theory, it is possible to argue that farmers can make an informed decision whether to participate in voluntary certification or buyers' requirement schemes on such terms (Herzfeld & Jongeneel, 2008; Souza Monteiro & Caswell, 2009). Taking a more critical Global Production Network approach (Coe et al., 2008; Sifaki, 2014) highlights market imperfections that weaken farmers' positions in supply-chain relationships. The power asymmetries benefiting corporate buyers over producers, especially small-scale family farmers, have been noted (RESOLVE, 2012; Röhrig et al., 2021). Third-party certification schemes in agriculture are often described as voluntary, as they are not required by law and farmers may choose whether to apply. However, in many contexts, participation in certain certification schemes is now a mandatory requirement if a farmer wishes to sell into certain markets. For international horticulture producers that wish to sell to supermarkets, GlobalGAP certification has become practically obligatory (Marzek, 2006; Bord Bia, 2010; Koç et al. 2011; Bernovici, 2016; FreshMazovia.com, 2018). Indeed, farming groups in developing countries complained to the European Union about the de facto imposition of GlobalGAP standards by European retailers but found no recourse, the EU telling them it could not intervene because such schemes are considered voluntary and reflect consumers' demands (Soon & Baines, 2013). In the UK, LEAF Marque certification is required, either explicitly or implicitly, by certain grain traders, manufacturers and the retailer Waitrose (Reed et al., 2017).

Much of the critical literature relates to farmers in developing countries, rather than in the UK (e.g. Henson & Humphrey, 2010; Muirhead, 2015; Oya et al., 2017). However, some academics in the field of business and supply chain management have considered how power asymmetries between supply-chain actors enable the imposition of buyer requirement schemes in developed countries (Spence & Bourlakis, 2009; Bain et al., 2011; Toschi Maciel & Bock, 2013; Brooks et al., 2017). Lamanthe and Rau (2014:62) noted that, following the growing power of supermarkets in supply chains, French fruit growers were “increasingly under obligation to comply with new norms in order to enter and remain in the global market”. Writing about private standards in the context of animal welfare governance, Toschi Maciel & Bock (2013:227) explored how European retailers assert their “market authority” to force farmers to comply with their requirements in emerging forms of governance that may be oligopolistic and non-transparent. In Northern Ireland, Brooks et al. (2017) studied how supermarkets and beef processors achieve dominance in their relations with beef farmers. Although their study does not relate specifically to requirement schemes, this idea is interesting, and is revisited in the conceptual framework (Chapter 4).

2.1.3 Markets and marketing networks

While there may have been relatively little critical scholarship on private-sector requirement schemes in UK agriculture, there is considerable literature on the dominance of supermarkets in UK food systems more broadly, and the negative effect this has had on farmgate prices and farmers' bargaining power (Ilbery & Maye, 2005; Dewick & Foster 2007; Bowman et al., 2013; Oglethorpe & Heron, 2013; Devlin, 2016). Researchers have also observed the limited number and influence of farmers' marketing cooperatives in UK agriculture (Hobbs, 1995; Bowman et al., 2013; Mansfield & Peck, 2013).

It was not possible to find a recent estimate of the marketing channels used by England's livestock farmers. In 2004, Lobley, et al. surveyed 655 organic and conventional farms in England, of which 64% were dairy, grazing or mixed farms (Table 2.1). They found the most common routes to market for conventional farms were: livestock markets; processors, which would include abattoirs for the cattle and sheep farmers; and unspecified 'other routes', which could include agents or brokers who then sell to abattoirs (Lobley et al., 2006). Direct contracts with supermarkets were rare, especially for the conventional farms.

Table 2.1. Routes to market of 655 English farms surveyed in 2004
Adapted from Lobley et al., 2006, p.55, table 3.14

Conventional farms			Organic farms		
Rank	Route to market	% of respondents who use this route	Rank	Route to market	% of respondents who use this route
1	Livestock market	33%	1	Direct/local marketing	39%
2	Other route	26%	2	Any with direct sales	38%
3	Contract with processor	26%	3	Other route	26%
4	Marketing cooperative	15%	4	Marketing cooperative	24%
5	Direct/local marketing	13%	5	Contract with processor	20%
6	Any with direct sales	13%	6	Livestock market	20%
7	Local shop	6%	7	Local shop	19%
8	Farmers' market	3%	8	Farmers' market	14%
9	Supermarket contract	2.5%	9	Box scheme	11%
10	Farm shop	1.7%	10	Farm shop	11%
11	Box scheme	0.3%	11	Supermarket contract	5.6%

Using a political-economy approach recognises the power imbalances that exist in agricultural supply chains. Although supermarkets might not purchase substantial volumes of livestock produce directly from farmers (see also Steedman & Falk, 2009), they have a powerful position in meat and dairy supply chains. Most meat consumed in the UK is purchased at a supermarket, including 91% of beef and 85% of lamb (AHDB, 2017). This includes meat produced in the UK and imported meat. According to Maye et al. (2018b), a slightly lower proportion of milk produced in the UK is sold in supermarkets – 76% – although no source for this figure is provided.

The influence of supermarkets affects not only farmgate prices but also the routes to market for beef and lamb producers. In 2017, a report prepared by the Agriculture and Horticulture Development Board (AHDB) for the Livestock Auctioneers Association noted that supermarkets preferred their abattoir suppliers to source livestock directly from farms, which was leading to a gradual decrease in the percentage of livestock sold through livestock auctions. The authors suggested that the supermarkets were deliberately attempting to shorten supply chains – or "phase livestock markets out" – in the interests of efficiency and price (AHDB, 2017:31). Closures of markets and smaller abattoirs hinder the marketing options available to livestock farmers and reduce opportunities for value addition (Ilbery & Maye, 2005). They can also result in higher haulage costs for farmers sending animals to market or to slaughter (All-Parliamentary Group on Animal Welfare, 2020).

The dairy industry has become dominated by powerful buyers and processors which lie upstream from supermarkets in the supply chain (Dewick & Foster, 2007). Asymmetries in the supply chain help to explain the low farmgate milk prices received by farmers, although farmers greatly value having a long-term contract with one of the dominant buyers (Maye et al., 2018b). Some farmers have 'aligned contracts', whereby they sell via one of the processors to a particular supermarket.

Changes in buyers' strategies are leading to new market-based relationships and networks for farmers. They include exclusive producer groups. For example, Waitrose sources all of its British beef through a single processing company, Dovecote Park, which in turn sources cattle from farmers who are regularly audited against a bespoke Waitrose standard and who benefit from belonging to a Beef Producer Group:

> "Dovecote Park strives to uphold a close relationship with our farmers, many of whom often visit our site for agricultural conferences, factory tours, and the bi-annual Carcase Competition. We also organise regular farm open days for our producers to share best practice, as well as socialise with one another and the Dovecote Park team" (Dovecote Park, 2020).

According to Jones (2014), supermarkets are creating these groups to ensure the supply of assured produce and to demonstrate that some farmers are being paid fairly. This phenomenon was predicted in 1995 by Hobbs, who was documenting the emergence of supermarket-driven requirement schemes at the time. She noted that supermarkets could reduce their due diligence costs in two ways: through vertical integration or through tighter contracts with quality assurance schemes. Hobbs foresaw that "a system of contracting between supermarkets and/or exporters on the one hand, and farmers organized into marketing cooperatives on the other, may develop as an alternative means of vertical coordination" (Hobbs, 1995:35).

In the dairy sector, the close relationship between milk producers and processors has led to the development of not only specialist requirement schemes but a framework of support and networking around them. Coyne et al. (2021) describe one dairy processor offering meetings, workshops and farm visits for its scheme participants, for instance.

Acknowledging the power asymmetries in political-economic structures does not deny individuals agency (Coe et al., 2008). Farmers have scope to adjust their systems and exercise agency to change their market position. This could include deciding to increase their autonomy and perhaps reduce external surveillance by developing direct marketing channels. Some European governments have provided support for the development of alternative food systems, such as farmers' markets, in response to supermarket dominance (Goodman, 2004; Morris & Buller, 2003). It is argued that when they are used outside asymmetric supply chains, third-party certification schemes become a tool for farmers to sell their producer in a wide range of markets, rather than a potential measure for control and risk transfer (Oglethorpe & Heron, 2013).

The literature provides a small amount of evidence of farmers in the UK who have diversified from supermarket-dominated marketing channels to alternative marketing channels. This includes a small number of reports from 5–10 years ago when the rise of Alternative Food Networks attracted researchers' attention (Morris & Buller, 2003; Ilbery & Maye, 2005; Morris & Kirwan, 2011). More recent are accounts of dairy farmers who are beginning to sell milk directly to consumers from the farmgate as a way to capture more value. In their 2017 survey of dairy farmers in the South West of England, Maye et al. (2018b) found a small amount of milk was being sold outside collective agreements with cooperatives and processors. A 2019 article in *Farmers Weekly* quoted figures from AHDB Dairy that around 200 producers – 2% of all UK dairy farmers – sold milk direct to consumers (Yates, 2019). Alternative routes to market are sometimes taken by beef and lamb producers to manage risk, capture more value from meat sales and regain some autonomy as price-setters, not price-takers. The Lobley et al. survey referenced above included 353 conventional farms. Of them, 6% of dairy farms, 8% of upland farms, 14% of lowland grazing farms and 28% of mixed farms conducted direct sales (Lobley et al., 2006). The evidence suggests that producers often participate in more than one channel and have fluid marketing strategies (Grando et al., 2016). This observation was made by Goodman (2004), who noted that Alternative Food Networks might function as an additional survival strategy for farms, rather than as a binary opposite to mainstream markets.

Another form of market-based farmer networks related to these alternatve channels are the nationwide certification schemes that are linked to particular farming systems. The Pasture Fed Livestock Association (PFLA), which has around 400 members in the UK and provides a system for farmers to have their produce certified, offers an online forum, farm tours and supplier discounts for members (PFLA, 2020b). In a survey of farmer members of the LEAF organisation, which runs LEAF Marque, 71% said membership had increased their contact with other farmers, partly through LEAF events, and several said they had received support training and information (Mills et al., 2010).

It has been argued that while some farms have recently strengthened local market routes, farming in general throughout Europe has undergone a shift from local, horizontal relationships and networks to dislocated, vertical relationships and networks that are related to farmers' more commercial supply chains (Renting & Oostindie, 2008; Bowen, 2011; Skuras & Dubois, 2014; Grando et al., 2016). Such market-based changes are relevant to this study if it appears that certain farmers are beginning to become involved in new relationships and networks which affect how they source and use labour, and human capital more broadly.

2.2 Effect of requirement schemes and marketing on labour

2.2.1 Private-sector schemes

Complying with statutory, voluntary or private-sector requirements has implications for the farm workload. Farms may need to undertake activities in three areas: (1) operational work, through adoption of labour-intensive farming practices; (2) administrative work such as keeping records, developing policies and preparing for inspections; or (3) either operational or administrative work because of requirements related to working hours, health and safety provisions, and so on (Ehlert et al., 2014). Other external requirements may be labour-saving, in that they reduce work that must be done on the farm or increase productivity.

External requirements can also change the nature of work that is needed. This can include a greater need for workers with technical skills and knowledge in a particular aspect of farming; or an intensification of demand at a particular point in the farming calendar. For example, organic conversion by New Zealand dairy farms increased their demand for workers with knowledge of sustainable pest and soil management (Schewe, 2015); while the imposition of the Maximum Residue Limits directive and other private-sector requirements in the Kenyan horticulture sector led to more jobs in packing and management (Humphrey et al., 2004). Research among grape producers in Greece found that when they began exporting produce, they faced higher quality requirements which increased labour costs. Although the grape producers faced other costs of production such as machinery costs, "the tasks that enhanced the quality of the grape were the labour-intensive tasks that could not be done with the use of machinery" (Sifaki, 2014:161). The changing nature of labour may be gendered, in that opportunities open up for roles for men or women (Sifaki, ibid.; Oya et al., 2017). A study of Kenyan vegetable farmers who sold to supermarkets found that they used more hired labour than other farmers, including a greater percentage of women workers for carrying out traditionally female-dominated tasks such as weeding and vegetable harvesting as well as tasks that were traditionally done by men (Rao & Qaim, 2013).

Whenever buyers introduce sustainability standards for suppliers to comply with, it can have a disproportionate burden on "smaller firms that lack the bureaucratic infrastructure and resources necessary to set up standardised procedures" (Spence & Bourlakis, 2009:299). It has been acknowledged that bureaucracy or paperwork place strain on many farmers (see Introduction). But relatively little has been written about the specific effect of requirement schemes on farm administrative work. Escobar and Demeritt (2016) provide a rare example of academic research on this topic. They interviewed 31 UK dairy and pig farmers, as well as private and government farm inspectors, to understand how livestock farmers were handling increasing demands for paperwork in relation to animal welfare. They found that "farmers complete their paperwork in fits and starts around the edges of their daily farmwork" (ibid., p.182).

The farmers in the Escobar and Demeritt study did not always complete paperwork, or rushed it at the last minute before an inspection, because keeping records updated was time-consuming and they could not see a use for it. Vets and inspectors interviewed by Escobar and Demeritt hoped that increased requirements for data capture would lead farmers to conduct more analysis and thereby improve livestock performance. However, the way that the farmers were being asked to record information such as animal deaths or medical treatments was not conducive to being able to use that information for managing the health and welfare of their animals; in any case, the farmers tended to prefer observing and working with the animals directly to solve problems. Farmers would often write their mandatory herd health plans not, as their vets hoped, as a management tool to guide their future husbandry strategies, but to document what they were doing already. Others saw the health plan as something their vet wrote for them, without their involvement. Drawing on experience with UK dairy farmers, Sibley (2006:115) noted that "a major incentive to maintaining good records is to make them purposeful". Reflecting on the recent imposition of herd health plans through farm assurance schemes, Sibley acknowledged that they did require extra time. "Time is precious, but not all time has the same cost. Using the quieter times of the day, or periods in the year, will be more efficient than succumbing to the pressures of creating a health plan at the last minute for the purposes of the farm assurance visit" (p.119).

Other studies have highlighted the impacts of external requirements in UK dairy farming, not only in administration but on workloads in general. In a study for AHDB, Webster et al. (2008:11) measured the labour-input on eight dairy farm and noted that on one farm, "farm assurance has taken up significant amounts of time – as has milk recording – which has been of particular concern". Also in the dairy sector, Coyne et al. (2021:9) interviewed 12 dairy farmers in north-west England about their participation in a private scheme run by their unnamed milk processor, and schemes in general. They report: "Farmers expressed concerns that requirements of the processors scheme was increasing over time and argued that having too many requirements to fulfil, placed them under increasing time pressure."

Outside the UK, there is a substantial body of literature on the challenges faced by farmers in attaining and maintaining compliance with international standards such as GlobalGAP (Asfaw et al., 2009; Souza Monteiro & Caswell, 2009; GIZ, 2011; Koç et al., 2011; Holzapfel & Wollni, 2012; Kirezieva et al., 2016). Such studies highlight the potential workload additions that can arise from certification, including the need to develop record-keeping and traceability systems. However, although it is acknowledged that "GlobalGAP is a complex and labour-intensive standard that requires large changes in farm management" (in the words of Holzapfel & Wollni, p.736), the studies do not dig deeply into the actual labour-related changes that can occur when a farmer joins a private-sector requirement scheme. Some do not adequately consider the use of both paid and unpaid labour on farms, or use inadequate proxy data for covariate analysis.

2.2.2 Agri-environment schemes

More has been written on the effects that AES have on workloads, both in the UK and elsewhere in Europe. Studies suggest that many practices promoted in AES have a measurable demand for additional labour. They include: sowing green cover and dealing with weeds that arise as pesticide use is decreased (Mettepenningen et al., 2009), establishing wildflower strips (Mills et al., 2018; Saxby et al., 2018), tree-planting (Ingram et al., 2009), managing hedges and walls (Harrison-Mayfield et al., 1998; Courtney et al., 2013) and repairing stone buildings (Courtney, et al. 2017).

Other AES requirements lead to a reduction of labour because they call on the farmer to suspend or downscale activities that can be environmentally harmful. They include a reduction in animal stocking rates, cessation of hedge-cutting and less application of fertiliser and pesticide (Harrison-Mayfield et al., 1998; Mettepenningen et al., 2009; Mills, 2012). As with private-sector schemes, it is important to consider the potential effects on other kinds of farmwork, not onlyfield operations. A survey of European farmers by Mettepenningen et al. (2009) found that AES participation increased administrative work by 17%, for example.

AES are typically designed to provide compensatory payments, whereby farmers are compensated for their participation costs and income foregone, but should not earn additional rent from the scheme (Bartolini et al., 2020). This is different from most private-sector schemes, where farmers bear some or all of the costs and, while there may be scope for farmers to obtain compensation or even rent from the market, it is not guaranteed. Participants in England's Countryside Stewardship AES are permitted to sub-contract operational work in their agreement to agricultural contractors (RPA, 2020). Several studies have recorded AES participants in the UK hiring contractors, often to assist with capital works related to drystone walls, stone farm buildings and historic landscape features (Courtney et al., 2013:36; Courtney et al., 2017; Harrison-Mayfield et al., 1998; Macauley Land Use Research Institute, 2000; Mills, 2012; Ingram et al., 2009).

However, AES are rarely recorded to have led to an increase in paid labour within the regular farm workforce. A 2009 survey of Environmental Stewardship participants in England suggested that direct employment effects of on-farm practices were minimal, with seemingly most of the work being carried out by existing farm labour (Courtney et al., 2013:36). A study of upland farms that received grants for managing buildings in the Yorkshire Dales National Park found that when farms undertook the building restoration work themselves, as opposed to hiring contractors, all of the work was done by existing farm labour (Courtney et al., 2017). Similarly, in a 2009–2010 survey for Defra of AES participants in England, 27% of the farmers reported that the scheme had increased their workload on the farm, but only 14% had hired additional workers or paid existing workers more to handle the workload (Mills, 2012).

Studies suggest that most farms can manage the workloads of an AES that cannot be outsourced by increasing hours or allocating the work to members of the workforce who might otherwise be under-worked. Farmers in the 2009-2010 study for Defra explained that the additional work required by their AES helped to keep underemployed family members and farmworkers busy during quiet periods in the year. One farmer even said, "Providing extra work for the family was the purpose of entering the scheme" (Mills, 2012:15). In other cases, an AES provided enough stable income for a family farm to keep a son or daughter in the business – a situation observed by investigators of the Welsh Tir Gofal scheme (Ingram et al., 2009). There is some evidence that farmers in Europe's LFAs (Less Favoured Areas) are especially likely to adopt AES because the additional income of the payment helps to counteract the low incomes from farming in marginal areas (Lasta-Bravo et al., 2015; Mantino, 2017).

It is relevant here to flag a methodological issue noted in section 2.3.2 below, which can affect whether unpaid family labour is included in calculations of labour effects of AES. For example, Scottish researchers concluded that on-farm employment impacts of an Environmentally Sensitive Areas scheme were minimal, but their calculation did not include additional unpaid labour done by the farmer; the researchers found separately that the subsidy payments are likely to have kept several farmers in business (Macauley Land Use Research Institute, 2000).

2.2.3 Direct selling

Now we turn from state-sponsored schemes to the possible labour effects of market participation, and direct selling in particular. Direct selling is a broad term that can be applied to: selling produce to consumers through face-to-face sales, vending machines or online; selling produce to hotels, restaurants, pubs and shops; or selling livestock direct to other farmers. It was argued above that some farmers are returning to direct selling in search of better returns and autonomy, and may be using third-party certification schemes to facilitate their marketing efforts.

Aubert (2015) observed that, depending on the nature of what is being sold and how, the labour requirements of direct selling can be less seasonal than farmwork. Some forms of direct selling such as farmers' markets or deliveries are time-sensitive and add inflexibility to the farmer's schedule (Mundler & Jean-Gagnon, 2019). Direct selling is multi-faceted work, which may involve processing, packaging, distribution, operating a website, face-to-face marketing and understanding regulations and clients' needs (ibid.). Padel (2017:4) argues that, "Farming is a skilful and demanding job, regardless of the types of crops grown and livestock kept, [which] leaves not… much time to think about anything else. For this and other reasons… many agricultural producers find it a challenge to be fully aware of the consumer's needs and wants and to consider them in the management of their business." Using French data, Aubert (2015:15) found that farmers who sold produce through short supply chains tended to work longer hours than other farmers and to employ more waged workers, which Aubert interpreted as evidence that the commercial activity of direct selling creates additional work, although the precise mechanisms of this are not identified. While Aubert (2015) observed that the French farmers got directly involved in the extra marketing work, a study of direct selling in Quebec found farm owners would avoid becoming over-worked by restricting their involvement in direct selling, often allocating sales duties to family members or staff (Mundler & Jean-Gagnon, 2019).

2.2.4 Diversification

Direct selling may be a form of on-farm diversification. Diversification in general requires some allocation of labour to the diversified activity. This may suit farms with a large existing workforce or farms whose workloads are highly seasonal, if the diversification business can be timed to meet the seasonal dips in farmwork (Meraner et al., 2015). Like AES, diversification might even provide a source of activity and income for family labour, especially if there are few opportunities for off-farm employment (Boncinelli et al., 2018). A modelling exercise of farms in Tuscany found that a farmer's decision to diversify was positively correlated with the number of workers available, which could explain why diversification was more common among large farms (with a larger workforce) than small farms (ibid.). The study implies that farmers decide to diversify when they have labour available that can be re-allocated, rather than deciding to diversify with the intention of hiring additional labour to work on the diversified business – although this distinction is blurry when a farm establishes a diversification enterprise to create work for a family member (Meraner et al., 2015).

Operating a diversification enterprise has implications for the farm labour system (Hostiou & Dedieu, 2011). In some cases, diversification results in labour being reallocated away from core farming work, and could create labour shortfalls (Gaskell et al., 2010). But diversification can also create additional employment, for either family or non-family members, or generate income that is then used to employ more labour in the core farming business. The workload of a diversification enterprise must be considered not only in and of itself, but also how it relates to other farmwork – diversification might account for a higher proportion of the total workload (and of the available labour) on a small farm than a large farm (Meraner et al., 2015). Certain forms of diversification require high levels of what Morris et al. (2017a:136) call "management resource".

2.3 Empirical review of labour in UK agriculture

2.3.1 Numbers of workers

Just over 309,000 people were working in agriculture in England in 2018 (Defra, 2019d). This covers farmers and spouses, business partners, farm managers and paid workers, but not agricultural contractors (Table 2.2).

Table 2.2. Estimated number of people working in agriculture in England, 2018
Data source: June Survey (Defra, 2019d)

Type or worker	Number of people	Percentage of total
Farmers, business partners, directors and spouses	178,128	58%
Managers	84,963	27%
Regular full-time workers	42,838	14%
Regular part-time workers	26,404	9%
Seasonal, casual and gang workers	49,853	16%
Total	309,039	100%

The sector where the largest number of people are found is livestock grazing, which accounted for 31% of all people working in agriculture when lowland and LFA grazing are taken together (Table 2.3). This is because livestock grazing makes up the largest group of holdings in the country, not because it is the most labour-intensive type of farming (Devlin, 2016). Instead, the most labour-intensive sector is estimated to be horticulture (Lampkin et al., 2014; Soil Association 2018). The Farm Business Survey estimates the Standard Labour Requirement (SLR) for different farming types in UK agriculture, expressed in units of FTE (Full Time Equivalent). The SLRs are highest for horticulture, pigs and poultry, and lowest for lowland grazing livestock (Table 2.4).

Table 2.3. Number of farm holdings and people working on them in England, 2018
Data source: June Survey (Defra, 2019d)

	Holdings		People working	
Farm type	Number	Per cent of total	Number	Per cent of total
Cereals	17,920	17%	47,974	16%
General cropping	17,392	16%	54,215	18%
Horticulture	4,149	4%	39,695	13%
Specialist pigs	1,935	2%	7,346	2%
Specialist poultry	2,811	3%	10,957	4%
Dairy	6,056	6%	26,539	9%
LFA	12,879	12%	27,756	9%
Lowland	33,554	32%	68,229	22%
Mixed	8,607	8%	25,307	8%
Unclassified	732	0.7%	1,022	0.3%

Note: 'holding' is not synonymous with farm. The four farm types covered in the present study are highlighted.

Table 2.4. Average annual Standard Labour Requirement per farm business in England, by type, 2018/19 Data source: Farm Business Survey (RBR, 2021)

Farm type	SLR (in Full Time Equivalent)
Horticulture	6.84
Pigs	6.29
Poultry	6.23
Dairy	5.87
General cropping	3.65
Mixed	2.93
Cereals	2.72
LFA	2.33
Lowland	1.80

The four farm types covered in the present study are highlighted.

2.3.2 Accounting for family labour

In farm business accounting, labour is counted as a fixed cost for the whole farm. Labour would not by default be included when calculating the financial performance, or gross margin, of an individual farm enterprise, when only variable costs are considered (Defra, 2006). However, for business analysis purposes, it is possible to include labour in the variable costs, especially casual labour or work done by contractors that can be allocated to a specific enterprise; or to add fixed labour costs afterwards and calculate the net margin of an enterprise (Defra, 2004a; Defra, 2006; Redman, 2017; RBR, 2020; RBR, u.d.).

Sometimes farm accounts only include paid labour rather than unpaid family labour as fixed labour costs (Defra, 2004a). When the value of unpaid labour is not accounted for, farms can seriously underestimate their production costs and income needs (ibid.). Valuing unpaid family labour is more common in management accounting (as opposed to financial accounting), but it still may exclude the work done by the farmer and other farm partners, since their work is expected to be compensated by what they earn in net farm income (Defra, 2006). The Farm Business Income measure used in the Farm Business Survey does not allow for any notional value of unpaid labour (RBR, 2020).

Therefore, unless unpaid labour is given a notional value and added as a fixed cost, the amount of labour that is calculated as a fixed cost to a farm business will vary depending on the proportion of labour that is wage or salary labour, as opposed to unpaid family labour. It is easy to see how a farmer could be tempted to cut fixed costs by transferring work from waged or salaried workers to unpaid family members, who might be prepared to work for longer hours or lower notional pay – or not even receive any money at all – and whose labour would not be properly captured in the accounts.

The inconsistency in how farm labour is recorded and measured can affect our understanding of the function of labour in agriculture. Unpaid family labour is often not quantified. For example, researchers conducting a study of an AES in Scotland developed farm budgets for study participants, but the farmers' own labour was not included in the budget calculation (Macauley Land Use Research Institute, 2000). In their 2010 study of English upland farmers, Gaskell et al. note that the farmers did not include the cost of family labour in their calculations of profits, so it could appear that smaller farms whose labour was done predominantly by the family had a better than average financial performance (Gaskell et al., 2010). Meanwhile, Nye (2018) has argued that agricultural researchers have failed to capture the replacement of permanent workforces with contractors in recent decades.

2.3.3 Trends in paid farm labour

The number of paid workers in English agriculture decreased significantly during the twentieth century (Armstrong, 1988; Errington, 1988; Morison et al., 2005; Olper, et al., 2014). Newby (1978) describes a "drastic" reduction in the permanent agricultural labour force as a result of the post-war adjustment of UK farming systems, while the remaining workers became more skilled and specialised. In 2002, Lobley and Potter documented that 50% of 255 surveyed English farms had lost at least one less full-time (or equivalent) worker from the workforce during the preceding five years (Lobley & Potter, 2004), which was only partly compensated by an increase in part-time farm employment.

The historical decline in England's paid agricultural workforce has levelled off in the past decade. Since 2008, the total number of people working in English farming has fallen by 1%, from around 312,000 to around 309,000 in 2018, but the proportion of those people who are paid full-time, part-time or casual workers – 39% – has not changed (Defra, 2019d). The levels of paid labour as a percentage of the total workforce are highest in horticulture (77%), poultry (48%) and general cropping (48%). In dairy farming the percentage of people who were paid workers actually increased during 2008–2018 (from 35% to 40%), but in mixed farming the percentage continued to decline (from 37% to 32%). On LFA and lowland farms, the proportion of all workers in the sector who were paid workers remained small during 2008–2018, decreasing from 20% to 19% in LFA farming and increasing from 19% to 21% in lowland farming. Indeed, England's Farm Business Survey shows that in 2017/18, some 59% of surveyed farms – of all types – used no paid workers at all (Table 2.5).

Table 2.5. Use of paid workers by farms assessed in Farm Business Survey, England, 2017/18
Data source: RBR (2021). Excludes farms with Standard Output below EUR 25,000

Farm size (based on labour use)	Number of farms	Number of paid workers	% of farms with paid workers
Very small	18,327	5,704	17%
Small	13,712	6,448	29%
Medium	7,378	5,741	47%
Large	7,406	11,190	67%
Very large	7,864	36,147	90%
Total	54,687	65,230	41%

One of the targets of the Common Agriculture Policy, to which the UK was subject before Brexit, has been to create and maintain jobs in agriculture and rural areas (Olper et al., 2014). Yet this is contradicted by government policies and commercial pressures that encourage an increase in productivity among farms, which is to be achieved partly through a reduction in farm labour. In the UK, for example, arable farms in England have been under pressure to reduce their production costs by optimising their use of both labour and machinery, which has helped to support the push for reduced tillage systems (Ingram, 2010).

Many upland farms have shed labour for economic reasons and become almost purely family-run operations (Gaskell et al., 2010; Elster Jones, 2015). Commenting on British sheep farms, Kirwan (2010:82) writes: "A common response… from farmers is that they will adapt to systems that they can run alone with family labour and casual labour exchange with neighbours, thus reducing or even eliminating the need for hired casual labour to a large extent." In some farms, the pressure also came from AES, whereby an enforced reduction in the stocking rate or a relocation of grazing livestock reduced the farm's need to employ hired labour (Gaskell et al., 2010).

Rural sociologists have considered how the shrinking of many farm workforces has affected the qualitative nature of agricultural work and worker wellbeing. Some highlight the loneliness faced by many farmers, farmworkers and contractors (Van der Ploeg & Renting, 2000; Laughton, 2017; Saxby et al., 2018). Writing in 1978, when British farming had already gone through a significant restructuring, Newby argued that as the number of farmworkers fell and their work became more mechanised and less manual and communal, workers had become more isolated from each other: "Most farmworkers today work in considerable isolation on board a piece of agricultural machinery" (Newby, 1978:21).

In 2011, an upland farmer described to a House of Commons committee the social and health benefits of creating enough work for farmers' children to be part of the farm workforce:

> "You have farmers and their wives in their 60s or 70s who are approaching the time when they may need some sort of assistance. Where you have encouraged generation overlap they [the family] will look after themselves; they become a little community, and that takes a great burden off the state. You have a younger person who can nip to the shops if someone is not well. There is a whole range of social benefits" (Cockbain in House of Commons, 2011).

The influential upland farmer James Rebanks (2020) tweeted:

> "And like lots of folk I almost never get a day off as we don't have any staff – it takes me minimum 4 hours to get the basic jobs done each morning (is usually 6–7). It doesn't bother me mostly but some days when it's rained for weeks I think I'm a bit sick of this today… When my dad was alive we could cover for each other for an odd day off. These days there isn't any cover. But that's just like loads of folk – like mums etc – overall I'm just lucky"

There are concerns that in some places in the UK and Europe that have witnessed a decline in farm labour workforces and rural outmigration, farming skills are being lost and there is not enough labour to manage systems sustainably; leading in some cases to land abandonment (MacDonald et al., 2000; Gaskell et al., 2010). Some actors now actively campaign for more labour-intensive farming systems in the UK so that more rural employment is generated and traditional land management techniques can be maintained (e.g. Ecological Land Cooperative, 2012, 2013; Landworkers' Alliance, 2018).

2.3.4 Casualisation and contracting

Even as the overall paid workforce has declined, English agriculture has witnessed a long-term increase in the proportion of workers who are seasonal and casual labourers (Errington, 1988). In 1980 this proportion was around 5%, rising to 7% in the mid-1990s and 16% in 2018 (Devlin, 2016; Defra, 2019d).

Particularly in horticulture and cropping, researchers have linked casualisation of agricultural labour to the expanding presence of supermarkets in food supply chains and their strategies of vertical integration and demanding productivity and efficiency. Rye and Scott (2018) note that product specialisation and intensification in suppliers' production regimes requires inexpensive, standardised and flexible ('just in time') labour, especially in horticulture. A study of apple and pear producers in Argentina found that supermarkets were encouraging 'de-seasonalisation' of production, which generated demand for labour outside the peak harvesting season (Lamanthe & Rau, 2014). The Soil Association also observed that in the UK, the horticultural season has been extended in recent years, which requires a longer and more consistent source of labour (Soil

Association, 2018). This has placed pressure on producers to change their labour strategies. Those strategies may include recruiting non-UK workers. Following the accession of eastern European countries to the EU, and also perhaps as a response to domestic labour shortages, the reliance on foreign migrant workers in UK agriculture has increased since 2014. Foreign migrant workers are now widely employed in the UK's agriculture sector; indeed, in 2018, migrants made up the majority of the seasonal agricultural workforce (Migration Advisory Committee, 2018). The most common countries of origin were Romania and Bulgaria (Gangmasters and Labour Abuse Authority, 2018).

June Survey data show that casualisation has also occurred in livestock farming (Defra, 2019d). Figure 2.1 shows how the numbers of full-time, part-time and casual workers in the four livestock sectors have changed over time, which has affected the proportions of the labour force.

- In mixed farming the proportion of paid workers in the sector who were casual workers increased from 20% in 2008 to 23% in 2018. The proportion of part-time workers also rose, from 29% to 31%, while the proportion of full-time workers fell from 52% to 46%.
- LFA farms had a greater reliance on casual workers to start with, and that increased over the period. In 2008, 34% of the small number of paid workers in the sector were casual, compared with 37% in 2018. However, LFA farming has not seen a concurrent increase in the proportion of part-time workers; their share fell from 41% to 38% and full-time workers actually increased from 25% to 26%.
- In lowland farming, 27% of all paid workers were casual in 2008, and this increased to 31% in 2018. As with LFA farming, part-time workers' share fell from 42% to 37%, however, and the proportion of full-time paid workers was stable at 31% in 2008 and 32% in 2018.
- Dairy farming is at the other extreme and here, the proportion of casual workers fell from 17% in 2008 to 14% in 2017. The proportions of part-time and full-time workers increased from 32% to 33% and 52% to 53%, respectively.

The increased reliance on casual labour on mixed and livestock grazing farms may be due less to the kinds of supply chain demands experienced by horticulture producers, and more to the economic pressures and farming system changes mentioned above that have led cattle and sheep farmers to cut labour costs and use less permanent paid labour (Errington & Gasson, 1996). This is discussed in more depth as a strategy of labour flexibility in Chapter 4.

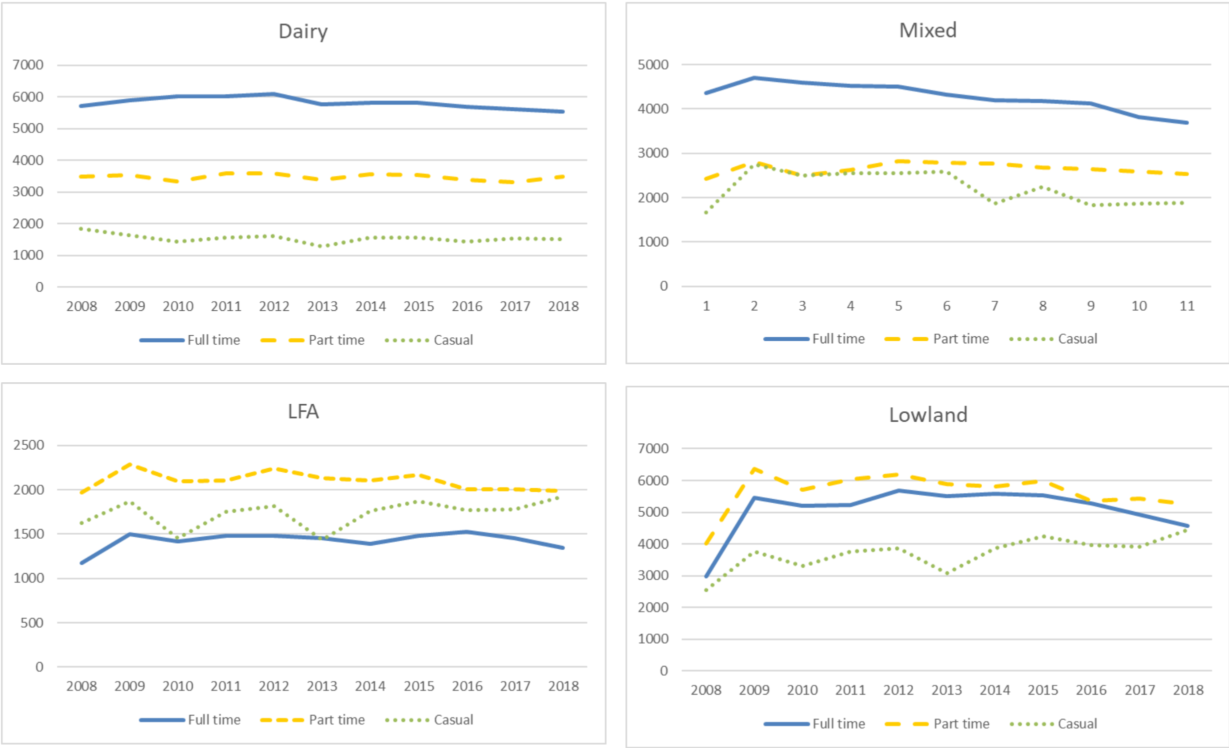

Figure 2.1. Numbers of full-time, part-time and casual paid farmworkers in England, 2008-2018, by farm type

Data source: June Survey (Defra, 2019d)

Note: Methodology for classifying farms changed in 2009, 2013 and 2018.

Another form of flexible labour is provided by agricultural contractors. Contractors are typically self-employed operators who are hired by farmers to carry out specific tasks. Farming's reliance on contractors has increased over the years. In 1981, a survey of farmers in the West Midlands and Wales found 69% were using contractors (Ball, 1987). More recent studies suggest that contracting has since become a ubiquitous means of labour and machinery outsourcing (Gaskell, et al., 2010:30). Nye's 2016 survey of 1,251 dairy, grazing and mixed farms in the South West of England found that 87% used contractors, who were hired for ploughing, sowing and drilling, pesticide application, combining, silaging and hedge-cutting. Nye concluded that "the majority of farm businesses of all types are now reliant upon agricultural contractors" and that contractors are "a significant source of agricultural labour" (Nye, 2018:5). In upland Wales, Elster Jones (2015) describes how the growth in contracting is closely linked to the changing use of machinery in farming:

> "Mechanisation and the ever increasing price of machinery has ... led to changes in the jobs that farmers do themselves, with one commenting that while he used to do all the jobs on the farm himself (with help from neighbours) now he has to get contractors in for some (e.g. silage-making) due to increasing costs of machinery. At the same time, the fact that fewer people are employed on the farm means that it can

> be harder to find people to help with the right skills, and some jobs are neglected (e.g. maintaining walls)."

The farms in Elster Jones' study had become more self-sufficient and less communal. It is possible that informal and collaborative relationships between farmers are more common when organic farms are involved. Since they are not permitted to apply synthetic fertiliser and must source fodder and preserved forage that is acceptable to organic standards bodies, organic farmers may need to arrange exchanges of, for example, farmyard manure and straw with other farmers to achieve the necessary nutrients for livestock and crops (Nowak et al., 2015).

2.3.5 How diversification and organic conversion affect livestock farm labour

Findings from the literature on production systems in English livestock farming are provided in Appendix 7, including some of the variations between upland and lowland systems. This section addresses two particular aspects of livestock farming where the patterns of labour use are noteworthy.

Diversification

Like other sectors of agriculture, livestock farms in the UK increasingly derive part of their business income from on-farm diversification enterprises such as tourist accommodation or renting out farm buildings (Bowler et al., 1996; Gaskell et al., 2010). Some authors discuss additional forms of off-farm diversification including contract work for other farmers, sometimes known as agricultural hirework, and income from off-farm employment.

It has been reported that livestock farms in upland areas have fewer opportunities to diversify into non-agricultural on-farm activities and face more obstacles to do so than lowland farms, because of their geographical remoteness and poor access to finance (Mansfield, 2008; UK Parliament, 2010; Short & Dwyer, 2012; IFLS/CCRI, 2016), despite government grants for on-farm diversification having been made available (Courtney et al., 2007; Select Committee on the Rural Economy, 2019). In 1996, Bowler et al. found that 29% of 200 upland farms in the Northern Pennines of England had an alternative farm enterprise; while in a 2010 study of 83 farms from several upland regions of England, 25% had an on-farm diversification enterprise (Gaskell et al., 2010). More recently, 50% of LFA farms in the 2018/19 Farm Business Survey for England recorded financial output from an on-farm diversification enterprise, compared with 60% of dairy farms, 65% of lowland farms and 71% of mixed farms (RBR, 2021). The LFA farms were notably less likely than other farm types to rent out farm buildings (Figure 2.2). Mixed farmers were very active in this area, however, as well as other forms of diversification. The likelihood of any farm having a diversification enterprise increases with size. Winter and Lobley (2016) similarly found that larger farm businesses are more likely than smaller farms to diversify.

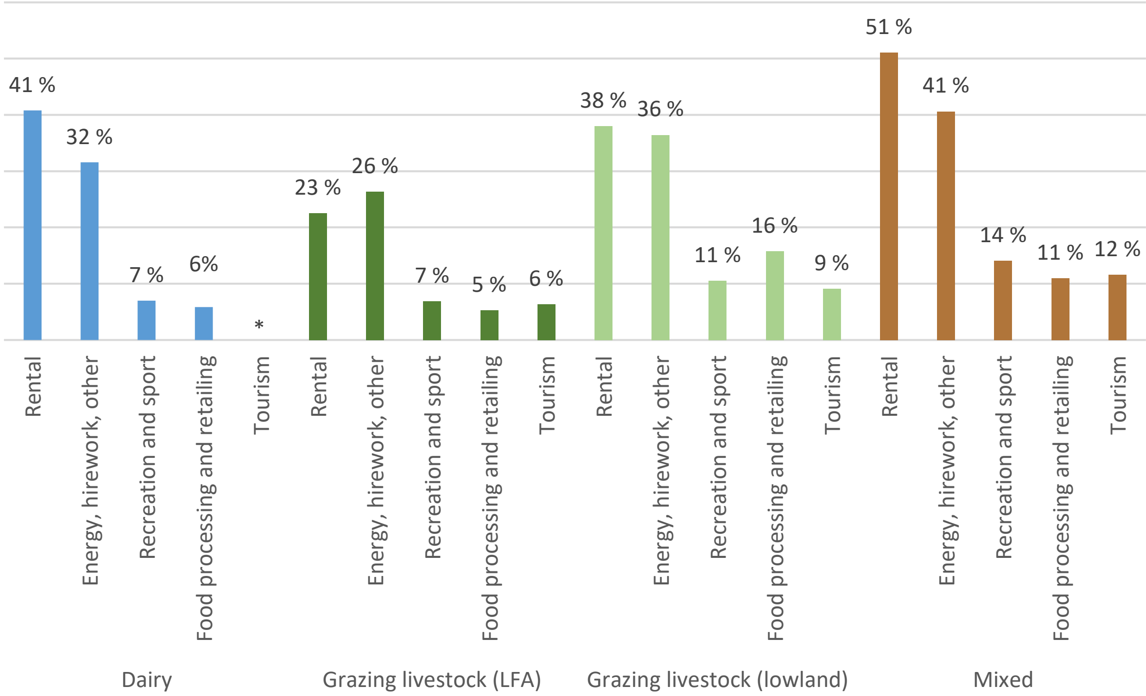

Figure 2.2. Percentage of livestock farms in England that recorded output from on-farm diversification in 2018/19, by sector and diversification activity
Data source: Farm Business Survey (RBR, 2021)

Note: farms could have more than one type of diversification enterprise.
* Data unavailable.

Staying with the Farm Business Survey, the available data support the above-mentioned findings in the literature that diversification has become more common over time (Table 2.6). Since 2003/4 (the oldest date for which data are available), on-farm diversification has spread in all livestock sectors and the average that each farm earns from diversified enterprises has increased also. In contrast, there has been less growth in off-farm contracting, or hirework; in 2018/19, the proportion of livestock farms in the Farm Business Survey that reported such activity ranged from 35% of the LFA farms to 55% of the mixed farms.

Typically, a diversified farm of any type in the 2018/19 Farm Business Survey had a larger workforce than the average farm within the same SLR group (Table 2.7). The farms with a diversification enterprise, particularly food processing and retail, used more paid labour than the average farm. This suggests an association between paid labour and on-farm diversification, but it is not proof that diversification always generates extra work since the data do not show whether the additional labour was allocated to the diversification enterprise or to work on the core farming business.

Table 2.6. Percentage of full-time grazing livestock and mixed farms with on-farm diversification and off-farm contracting output, England, 2003/4 and 2018/19
Data source: Farm Business Survey (RBR, 2021)

(a) On-farm diversification

	Percentage of farms with		Average annual output per farm (£)	
Farm type	**2003/4**	**2018/19**	**2003/4**	**2018/19**
Cereals	72 %	74 %	9,847	18,155
General cropping	55 %	70 %	5,585	18,136
Horticulture	50 %	63 %	9,693	13,263
Dairy	44 %	60 %	2,425	9,351
Lowland	53 %	65 %	4,914	9,743
LFA	36 %	50 %	651	2,664
Pigs	33 %	59 %	4,953	15,665
Poultry	39 %	58 %	3,796	26,029
Mixed	48 %	71 %	4,314	13,748
All farm types	52 %	66 %	5,390	12,950

(b) Off-farm agricultural hirework

	Percentage of farms with		Average annual output per farm (£)	
Farm type	**2003/4**	**2018/19**	**2003/4**	**2018/19**
Cereals	55 %	52 %	8,230	21,951
General cropping	52 %	58 %	11,737	16,492
Horticulture	*	19 %	*	4,626
Dairy	36 %	41 %	3,027	6,843
Lowland	41 %	42 %	2,110	3,932
LFA	33 %	35 %	1,644	2,610
Pigs	*	*	1,442	*
Poultry	*	*	*	*
Mixed	52 %	55 %	3,868	12,630
All farm types	42 %	45 %	4,890	10,963

The four farm types covered in the present study are highlighted.
* = data unavailable.

On the average full-time farm with a tourism or food processing or retail enterprise, the working hours recorded by the spouse of the principal farmer were 38% and 58% higher than average, respectively. As for the principal farmer, their working hours were slightly higher than average when the farm had a diversification enterprise in tourism (5% higher for all full-time farms) or food processing and retail (3% higher). The findings are consistent with the argument of Aubert (2015) that customer-facing diversification such as direct selling creates additional work for farmers and that farmers need to be present to manage the multi-faceted nature of a diversified enterprise. But since we do not know from the data where the farmer's labour was allocated, it is possible that without diversification the farmer's labour input would be even less, or that the farmers diverted some of their time from farm work to the diversification business and made up the shortfall with other sources of labour.

Table 2.7. Average labour input (AWU) of labour sources on full-time farms with a diversification enterprise; and difference (%) from average of all full-time farms, England, 2018/19
Data source: Farm Business Survey (RBR, 2021)

	Rental		Recreation and sport				Food processing and retail		Tourism	
			<£10,000		>=£10,000					
Labour source	**AWU**	**%**	**AWU**	**%**	**AWU**	**%**	**AWU**	**%**	**AWU**	**%**
Principal farmer	0.98	1%	0.97	-1%	0.82	-16%	1.01	3%	1.03	5%
Spouse	0.13	-11%	0.10	-29%	0.17	16%	0.22	58%	0.20	38%
Business partners	0.35	2%	0.39	16%	0.33	-4%	0.36	6%	0.24	-29%
Paid labour	2.64	46%	2.31	28%	3.49	94%	2.62	46%	*	/
Total labour input	**4.15**	**25%**	**3.8**	**15%**	**4.81**	**45%**	**4.30**	**30%**	**4.62**	**39%**

Includes all full-time farms, even those that had no labour input from spouse, business partners or paid labour. 'Full-time' includes small, medium, large and very large farms, by SLR, but excludes very-small part-time farms.
'Paid labour' = full-time paid, part-time paid, casual paid, farm manager and trainees.
Each diversification category shows average AWU of farms where financial output from that category was >£0.0. Recreation and sport enterprises are separated in those with an annual output below £10,000 and those with an annual output above that.
* = Data not available from FBS

Organic conversion

One type of farming that is associated with high levels of on-farm diversification is organic farming (Morison et al., 2005; Green & Maynard, 2006; Lobley et al., 2006). Organic farmers comprise a small percentage – around 2% – of all farms in England and Wales (Defra, 2019h). Among them were 1,508 certified organic livestock producers in England in 2018, farming 241,000 certified cattle and 374,000 certified sheep; and a further 517 producers in Wales (ibid.). There is substantial regional variation, however, and the target locations of the present study have higher than average organic representation, with the South West region (of which Wiltshire is a part) accounting for 51% of all organic livestock producers in England in 2018 and the West Midlands (including Herefordshire and Shropshire) accounting for 12%.

Organic farming is typically described as more labour-intensive than conventional agriculture (Green & Maynard, 2006; Baret et al., 2015). However, this may be skewed by figures from horticulture, pigs and poultry (Laughton, 2017). When a farm follows an organic or low-input livestock production system, the literature suggests that several factors affect how workload and labour costs are affected:

- Adoption of labour-intensive or labour-saving practices;
- Stocking rate, which is often lower in organic than conventional systems;
- Any work done in processing and direct selling, which is often more common on organic farms;

- Access to organic support payments and other AES income, which can be used to fund additional work;
- Any changes in skills needed as the nature of work changes;
- Profitability and wage rates.

Variation in these factors on individual farms makes it difficult to generalise about the labour effects of organic farming, especially with the small sample sizes that often feature in research studies.

When it comes to farming practices, organic and low-input livestock farming can increase labour requirements for certain tasks at certain times of the year, such as checking weaned calves more frequently rather than rely on vaccinations and antibiotics (whose use is restricted under organic standards). Because their use of wormers is also restricted, organic farmers must devote time and effort to control the worm burden in livestock with grazing strategies such as creating clean pasture or alternating species grazing annually (Younie & Wilkinson, 2001; PFLA, 2016). However, organic farmers may save time that would otherwise be spent applying synthetic fertiliser and pesticide. Many organic farms have lower stocking rates than conventional livestock farms (Baret et al., 2015).

In their 2004 survey of English farms,[1] Lobley et al. (2006:68) found that the average workforce in FTE per hectare was lower on organic than conventional farms in the dairy, LFA and lowland sectors, but higher in the mixed sector. Using Farm Business Survey data, Lampkin et al. (2014) studied the financial performance of a larger sample of organic and conventional farms in England and Wales between 2006/7 and 2011/12. Like Lobley et al., they found that except in mixed farming, the organic farms with livestock had similar or lower levels of labour-input to their conventional peers. More recent reports produced for the English Farm Business Survey from a sample of conventional and organic LFA farms were analysed (Harvey & Scott, 2015). In 2013/14 and 2014/15, the organic farms used more labour input per farm than conventional farms – averaging 1.9 FTE versus 1.5 FTE per farm – but again less per hectare (0.6 versus 1.1 FTE).

The studies suggest that although they do not necessarily use more labour-input overall, organic livestock farms – especially LFA and lowland farms – tend to use a larger proportion of paid labour than conventional farms and/or have higher paid labour costs. This chimes with analysis that the PFLA (2016) commissioned of a sample of its members, who, if not actually organic, had low-input production systems. For lowland beef finishing and suckler cow enterprises, the PFLA members' labour costs, including paid and unpaid labour, were higher than the top industry performers' but lower than the industry average labour costs. In sheep, the PFLA members' labour costs were

[1] Estimated sub-sample: *n*=415.

higher than even the industry average. Lobley et al. found that wages were typically higher on organic than conventional farms in England in 2004, so that could be a factor. Another factor could be the greater tendency for organic farms to have on-farm diversification enterprises, which, as argued above, are sometimes positively associated with paid labour. In the case of the organic LFA farms in the 2013/14 and 2014/15 FBS mentioned above, they also earned more in Basic Payment and AES payments than conventional farms. This could help explain why the organic LFA farms spent more than their peers on casual labour and contractors, and could also support the findings of several studies that AES create employment on upland farms (see section 2.2.2).

As mentioned, the picture is complex, and a review of recent FBS reports in dairy farming reveals a different pattern (McHoul et al. 2013; 2014; 2015; 2016; 2017; Smith et al., 2018). Over a five-year period from 2011/12 to 2016/17, paid labour costs were lower on organic dairy farms than conventional dairy farms per hectare and per farm – the opposite of what Lampkin et al. found for 2006/7–2011/12 – while imputed unpaid labour by principal farmers and spouses was about the same. The organic farms' financial output was lower, not only from milk yields but also other areas of the farm business, so perhaps they had less money available to spend on wages. Possibly the organic dairy farms spent less on paid labour because they had smaller herds or less labour-intensive production systems than the conventional dairy enterprises (Maye et al., 2018a). Or there may have been attitudinal or skills barriers to paid employment. Schewe (2015) observed that organic dairy farmers in New Zealand increased their reliance on family labour after conversion because of the specialist skills and knowledge required:

> "The complexity of organic dairy management systems requires a unique skill set from staff: competence in homeopathic animal care, knowledge of organic soil fertility methods and skill with organic pest and weed control. Organic certification also requires familiarity with ever-changing organic standards and careful record-keeping. For many organic dairy farmers, finding and training staff to deal with all these unique issues was simply not feasible" (p.95).

Overall, the literature suggests that organic livestock production systems are not common in the study regions but that they present interesting differences in their workload profiles and their use of paid labour.

2.3.6 Labour scarcity

Around the world, agricultural sectors are facing structural issues of ageing farmers and wage labour scarcity. The literature suggests that farms in a range of contexts have experienced difficulties recruiting skilled or unskilled labour (MacDonald et al., 2000; Kasimis &

Papadopoulos, 2005; Xiloyannis, et al., 2008; Cush & Macken-Walsh, 2016; Delgado Wise & Veltmeyer, 2016; IFAD, 2016; Li & Tonts, 2016; Mukhamedova & Wegerich, 2018).

These issues also affect the UK. In the lead up to and following Brexit, there has been concern about shortages of workers from the EU in labour-intensive sectors that rely on migrant workers, notably horticulture, dairy and support services such as veterinary firms and abattoirs, but mixed farms and livestock farms have also been affected (Gaskell et al., 2010; Environment, Food and Rural Affairs Committee, 2017; Dorward & Baldassari, 2018; English Apples & Pears, 2017; Nye, 2018; RABDF [Royal Association of British Dairy Farmers], 2017).

Common reasons given in the literature for labour shortages in the UK include the unappealing nature of farmwork and lack of opportunities for career progression, competition from other employment sectors, and difficulties in the recruitment of EU workers caused by the fall in the value of the pound, improving living standards in home countries, post-Brexit uncertainty and xenophobia. Farmers face several impediments to recruiting labour, including the fact that farms are often located in areas where unemployment is not particularly high, the lack of affordable housing in rural areas near farms, and an increase in strictness of labour legislation and in associated paperwork (Laughton 2017; Environment, Food and Rural Affairs Committee, 2017; Migration Advisory Committee, 2018; Nye. 2018; Soil Association, 2018).

The absolute scarcity in labour is related to the historical restructuring and modernisation of UK agriculture, which has affected the local pool of resources that farmers can draw from. In 2018, the National Association of Agricultural Contractors (NAAC) told the UK Migration Advisory Committee:

> "The decline in small farms and the resultant loss of farmers and farmworkers has greatly reduced the available pool of experienced labour. Where a few years [ago] we would all have a 'book' of local farmers' sons and staff we could call on for help at peak times, this has virtually gone in some areas" (NAAC, 2018).

Similarly, a 2010 study of upland farming for Defra found that economic and social pressures were leading to labour shortages and a loss of skills in animal husbandry, land management and maintenance. One farmer said: "If you lose the skills out of the hills, if you lose the people, you aren't going to get them back" (Gaskell et al., 2010:53).

As farmers age, they become less willing or physically able to do certain tasks on the farm. This can affect the farm business and farming system. Evidence suggests there is a desire among young people to work in agriculture (Soil Association, 2018). However, their aspirations may be stymied by the barriers mentioned above. In some scenarios, ageing of farm proprietors and/or a shortage of labour has led to significant retrenchment or even abandonment (Gaskell, et al., 2010; MacDonald et al., 2000). In England, it was reported in 2018 that apple and pear producers were scaling back production and some were planning to remove orchards as a direct result of waged labour shortages (Dorward & Baldassari, 2018). A study published by AHDB (2018b) found that a lack of trained personnel may be hindering productivity in UK agriculture.

Efforts have been made to understand the formal and informal institutions that farmers could use to access labour. Examples include groups of farmers buying machinery collectively, which can spread to sharing labour (Flanigan & Sutherland 2015); and the Moorskills project, where farmers in Dartmoor collaborated to recruit apprentices (UK Parliament, 2010). In Ireland, an ageing farm cohort and increasingly scarce family labour has encouraged innovative Joint Farming Ventures, whereby local farmers share machinery, stock and profits (Cush & Macken-Walsh, 2016). There is also the informal institution of *meitheal*, where neighbouring farmers cooperate in work parties at busy times (Keogh, 2014). Such institutions are relevant to the farmer networks discussed in section 2.1.3.

2.4 Theories of labour flexibility and under-employment

2.4.1 Labour flexibility

A starting assumption of this study, based on the literature reviewed so far, is that livestock farmers are experiencing demands on their time from requirement schemes. We have also seen that some farmers are pursuing opportunities to improve their routes to market. Both phenomena may be affecting farm workloads. If so, then the question is, how do farmers cope with the change? According to the literature, at least part of the answer to this may lie in labour flexibility.

In 1996, Errington and Gasson wrote about the increasing importance of labour flexibility to farming in England and Wales. They referenced a framework developed by Atkinson for the world of business. In a paper called 'Manpower strategies for flexible organisations', Atkinson (1984:29) proposed three types of labour flexibility that were helping firms respond to economic challenges and technological change: *functional flexibility*, where "employees can be redeployed quickly and smoothly between activities and tasks"; *numerical flexibility*, where "headcount can be quickly and easily increased or decreased in line with even short-term changes in the level of demand for labour" so that "at any time the number [of workers] exactly matche[s] the number needed"; and *financial flexibility*, so that employers have "pay and remuneration systems that facilitate numerical or functional flexibility [and] reflect the state of supply and demand in the external labour market".

This is a useful framework for agriculture and was referenced recently by Nye (2017) in relation to labour in British farming, and by Greenhalgh (2010) in relation to agricultural contracting in

New Zealand. If we apply this framework to the question of how farms respond to a change or increase in their workloads, we could theorise that the ability of a farm to respond depends, at least in part, on its having *functional flexibility* to be able to redeploy workers or reallocate labour, and having the *numerical flexibility* to quickly increase or decrease the supply of labour.

Figure 2.3 depicts labour being redeployed by a functionally flexible farm. On-farm labour is diverted from Task A to Task B. If the need is temporary, then the labour is allocated back to Task A afterwards. Alternatively, a person diverts their labour to Task B from off-farmwork, Task C. The measure of functional flexibility depends on the speed with which the labour can be redeployed, and if the workers have the necessary skills, knowledge and capital to do a new task.

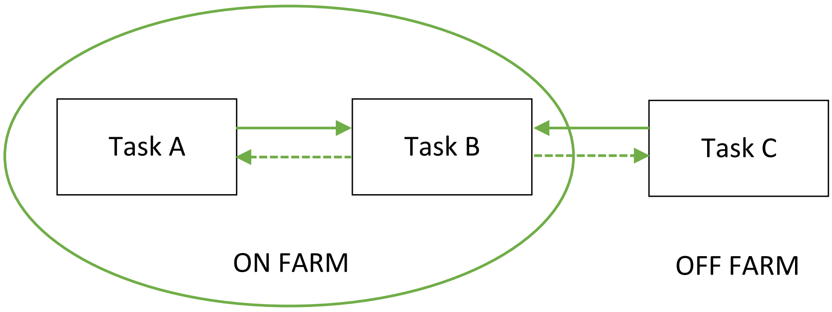

Figure 2.3. A model of functional flexibility using on-farm and off-farm labour
Created by author

When it comes to numerical flexibility, Atkinson (1984) thought that an ideal firm would have a core full-time workforce which remained stable; and a peripheral workforce of (a) dispensable workers whose numbers would be increased or decreased in response to business activity and (b) more valuable workers who would be employed on flexible terms, such as part-time or short-term contracts. Atkinson's concept of numerical flexibility thus applied to fluctuations in both the *number of people* in a workforce and the *hours or employment periods* of those employees.

This distinction is developed further in Figure 2.4. In this figure, it is proposed that the concept of numerical flexibility could be used to describe fluctuations in the amount of labour-input provided by individual farmworkers. Any member of the farm workforce could vary their labour-input: not only a peripheral employee such as a seasonal labourer but also a core farm member such as the principal farmer (Errington & Gasson, 1996:133). This is shown in Model B of the figure. The headcount has not changed, but the labour-input has grown through an increase in labour-time or labour-effort by the existing workers. Model A depicts the other situation of numerical flexibility described by Atkinson, where the headcount of the workforce is increased quickly and easily. The farm may have drawn the additional labour from family, the labour market, agricultural contractors or, informally, by enlisting the help of another farmer; doing so requires capital and/or access to labour networks.

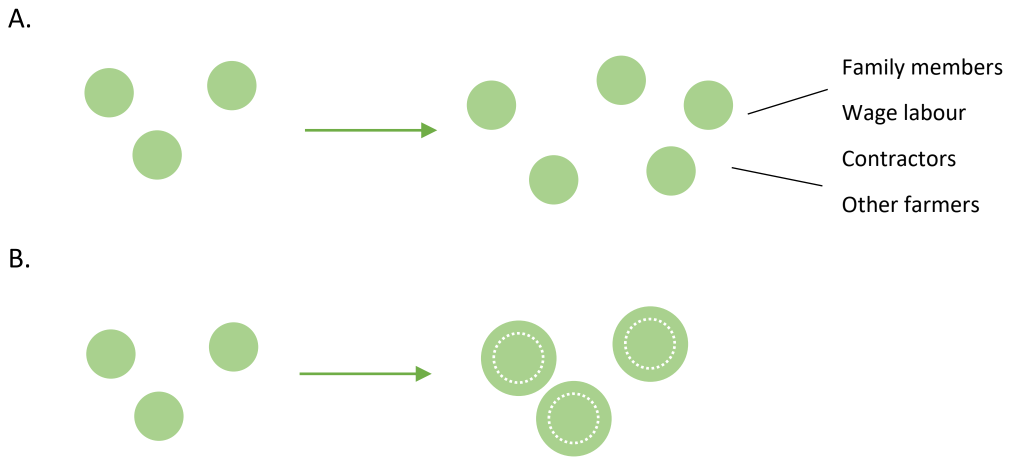

Figure 2.4. Two models of using numerical flexibility to increase labour supply
Created by author

Later in this chapter, these ideas of labour flexibility are related to theories of resilience. Before then, we consider how economic thinking about labour in agrarian settings helps us to understand how flexibility might be achieved.

2.4.2 Under-employment or over-employment?

2.4.2.1 Stretching the family workforce

Errington and Gasson (1996:130) noted that numerical flexibility is important in agriculture because of the unpredictability and seasonality of farmwork. They observed that farmers in England and Wales in the 1990s were matching their labour forces to their "peaky labour profiles" by shrinking the permanent farm workforce and using flexible forms of labour, such as part-time workers, temporary workers and self-employed contractors, to add to the workforce when needed. In this way, Errington and Gasson wrote, "[farms] can ensure that the permanent workforce is used to full capacity, with the minimum of slack". But what do they mean here by "slack"? The concepts of under-employment and labour surplus provide a way of interpreting this.

Under-employment is generally understood to mean a shortfall in potential worker output (Bell & Blanchflower, 2013). Some economists and sociologists argue that under-employment has to do with the quality of work. For example an under-employed person could be someone who is overtrained for the work that they do (Feldman, 1996; Friedland & Price, 2003; Bell & Blanchflower, 2013). This can be extended using neoclassical economic theory to conclude that someone is under-employed if they are earning less in their present employment than the opportunity cost of working somewhere else (Olfert, 1992).

Chayanov and under-employment

Another way to interpret under-employment is to focus on the quantity rather than quality of work done. In agriculture, 'under-employment' may be used to describe a surplus of labour, where either an individual person does not work as many hours as they could or there are excess person-hours in a whole system (Leibenstein, 1957). Hence some authors who write about under-employment in agriculture describe farms being 'over-manned' (Edwards, 1981; Ball, 1987). This form of under-employment is sometimes called time-underemployment (Loughrey & Hennessy, 2014). Conversely, a farm workforce in a state of over-employment could be 'under-manned'.

Ideas of under-employment or related concepts in agriculture often relate to the family farm. In the early twentieth century, Chayanov advanced the theory that the family farm ordinarily operates in a condition of under-employment, in the sense of having a surplus of under-utilised family labour. Chayanov argued that "the peasant family labour force is far from fully utilized" (Chayanov, 1966 [1925]:75). Partly this is due to practical reasons: the seasonality of agriculture and unpredictability of the weather mean that at some times of the year, there was very little farmwork to do. But the under-utilisation of labour theorised by Chayanov goes beyond practicalities, to the motivations of family farmers. This is nicely summarised by Blanc et al. (2008), who argue that whereas capitalist agricultural enterprises aim to maximise profit, family farms aim to maximise household utility. Since they own their means of production, peasants do not need to earn a profit. A peasant can decide for him or herself how much of their own labour-power they wish to put to work, a phenomenon known as self-exploitation. As a family grows, so too do its resource needs, so the household members will increase their labour-time and labour productivity; but when a family shrinks – for example, when children leave home – the balance shifts back. The economic conditions observed by Chayanov in nineteenth century Russia are different from those faced by family farms operating in the UK today. But Chayanov's theories highlight an important point, which is that family farm members can, to some extent, decide their own working hours (Van Der Ploeg, 2013). This must provide some flexibility in the farm labour system.

Following Chayanov, economists in the twentieth century developed the concept of disguised underemployment or disguised unemployment to describe the surplus under-utilised labour they perceived to exist in the small-scale agriculture of developing countries (Sovani, 1959:17). Errington (1988:5) argued that a similar situation could occur in a developed economy such as England, if a farmer's son or daughter found themselves unemployed and returned to the family farm, but was not really needed. In this situation, Errington says, "the workload will be divided between members of the workforce in such a way that none are fully occupied." Errington uses the phrase 'fully occupied' without definition, but the implication is that there is an optimum level of full-time employment at which a person works throughout the year, albeit their daily hours might fluctuate according to the peaks and troughs of the farming calendar. The son or daughter would not be idle, but they would add barely anything to the output of the farm; the marginal value product of their labour would be close to zero. Therefore, "if one person were removed from the workforce, the others could maintain the same level of total output by working slightly more hours" (ibid.). Errington suggests that the presence of the son or daughter would pull the workforce into a state of under-employment by reducing the labour-input being provided by each worker. That is, their presence would create a surplus of labour in the workforce.

The notion of a labour surplus could apply to a surplus of labour-time or to a surplus of labour-effort (Leibenstein, 1957; Dovring, 1979). People could work longer or they could work harder. In his analysis of the change in the nature of work that occurred during industrialisation, Marx (1867 [1990: 533]) connected the two. He wrote that if a working day is lengthened, then it will lead to an decrease in workers' labour productivity and labour intensity; and vice versa (p.663). This raises the possibility that we should not consider *time* independently from *effort* when evaluating if under-employment exists. If a person works few hours, perhaps their hours cannot be extended without losing effort or intensity.[2]

Kautsky and over-employment

In most of the writings reviewed so far, it has been proposed that surplus labour or slack in the farm workforce is undesirable. When there are too many people in the workforce not working enough hours throughout the year, it creates a financial drain on the business and impedes labour productivity.

But the literature also suggests that having some slack in the sense of unused labour that can be mobilised, or having some labour-time in reserve, helps farms to cope with the temporary increases in labour demand that are intrinsic to agriculture. Indeed, Errington and Gasson (1996) noted that one of the reasons why farms were increasingly using temporary labour is that there were sometimes not enough people remaining in the permanent workforce to muster for routine jobs, let alone for peak periods or emergencies. Not only is slack helpful, it is essential. Farm workforces simply must be able to vary their labour-input throughout the season.

This suggests that farms have to find more cost-effective ways of mobilising unused labour than operating with an under-employed labour surplus. In the ideal scenario described by Atkinson and interpreted by Errington and Gasson, flexible farms can mobilise extra labour by recruiting

[2] The concept of a surplus of under-utilised labour is different from Marx's concept of surplus labour-time, which describes the period of a worker's shift when their labour goes into producing surplus value for their capitalist employer, as opposed to the earlier part of their shift when their labour produces something whose value is equal to the amount of money that the worker needs to cover their living costs (Marx, 1867 [1990]).

additional workers at peak times. They may also be able to add labour by extending paid workers' hours in a formal way, for example by paying overtime; or by deploying functional flexibility to reallocate workers from areas of the farm which are momentarily quiet to other areas where labour is needed.

But is it not realistic to assume that some farms also mobilise additional labour-input by extending working hours to the point where workers move from full employment to over-employment? This might be especially necessary if farms cannot afford temporary sources of additional paid labour. These farms' reserves of labour-time would be found in family members and other workers being willing and able to work long hours beyond the acceptable threshold of the hours worked by a 'fully occupied' worker. Their workforces might not have any slack or surplus as described here, but would nevertheless have the capacity to stretch when needed.

This proposition relates to the theory developed in the late nineteenth century by Kautsky that, rather than having slack in the system from under-worked family members, family farmers already put in high levels of labour-effort and are willing to work very long hours when needed. Kautsky, a Marxian scholar who has been positioned in opposition to Chayanov (Banaji, 1976), argued that peasant farms could only compete with large-scale agriculture through over-work: they "put in more labour per worker" (Djurfeldt, 1982:141).

Empirical research from the present day supports the proposition that family members may be more prepared to work unsociable hours or at weekends than wage workers or contractors, and better able to change their working hours at short notice (Greenhalgh, 2010). Some studies reveal a lengthening of worked hours in farming households caused by workforce restructuring. For example, Darnhofer and Strauss (2014) found evidence from family farms in Austria and Switzerland of very long hours, stress and burn-out among men and women in the farm household, caused by diversification of the farm business and combining farmwork with off-farm employment. In their study for AHDB on labour productivity in dairy farming in the UK, Webster et al. (2008) found that when the value of family labour was removed, the total labour cost of the highest cost producers was significantly reduced. They concluded that farmers and family members may be over-working, or "over-investing their own time" (p.23). Especially on dairy farms that employed few paid staff, Webster et al. concluded that farmers risked spending too much time on day-to-day operations as opposed to strategy and management. Some writers have expressed concern over the effect of long working hours on farmers' mental health in the UK, in combination with financial worries and a decline in support networks (Laughton, 2017).

Using these two perspectives, we can reconsider the form of numerical flexibility that was theorised earlier (as depicted in model B of Figure 2.4), where workers increase their labour-time.

Figure 2.5 proposes two scenarios in which this could happen. On the left, the worker is under-employed, or at least is working fewer hours in the farm business than the standard 9–5 or equivalent of a "fully occupied" worker. By increasing their hours, perhaps by diverting their labour from an off-farm source of employment, the worker nears full employment (model A). This is reminiscent of the Chayanov position. On the right, we see a more worrying scenario (model B) in which a worker who was already in full employment has increased their labour-time and become over-employed by working overtime, which may or may not be compensated (Errington & Gasson, 1996:133). Very loosely, this is closer to Kautsky's position and characterises the descriptions of over-worked farmers in the literature.

Figure 2.5. Two scenarios in which a worker can increase labour-time
Created by author

2.4.2.2 Adding to the family workforce

Kautsky noted that peasant farms had another characteristic that enabled them to compete with corporate farms, which was the option of involving farmers' children in production. This links to the other kind of numerical flexibility described above: the possibility of drawing from a pool of labour – in this case family labour – from beyond the core workforce. Having family members to call upon gives farms the flexibility either to respond to a temporary increase in workload, or to make changes to their farm business that require more labour-input without taking on the cost and risk of hiring paid staff (Errington & Gasson, 1994).

This reservoir of family labour could include older people as well as children (Greenhalgh, 2010). There is also increased recognition among researchers of the flexible role played by female members of farming households (e.g. Olfert, 1992; Cullen et al., 2016; Gasson & Winter, 1992; Whatmore, 1991; Pomeroy, 2015; Alston et al., 2017). One way in which women provide a flexible source of labour is by adjusting the balance between on-farm and off-farm employment according to needs on the farm. However, studies have identified gender power imbalances that may exist within farming households, which lead to situations where women are expected to do farmwork on top of off-farm jobs, paperwork and family care work (Gasson & Winter, 1992; Darnhofer & Strauss, 2014). This could be evidence for over-employment of women in family farms, and/or a demonstration of how family farms are able to cope with workloads by drawing opportunistically on family labour sources.

A downside of relying upon family labour sources is that the system can be hit with sudden shocks if a family member becomes ill or withdraws their labour unexpectedly (Errington & Gasson, 1996). Farms may need to cope not only with an abrupt change in a family member's availability, but also a change in their preferences (Darnhofer & Strauss, 2014). Errington and Gasson (1994:300) observe that as farm households change over time, family farms can go from being "under-employed" to "over-stretched" and back again.

2.4.2.3 Incorporating non-family labour

In addition to considering the nature of family labour and farming households , researchers have considered how forms of non-family labour are integrated into flexible (or not so flexible) farm labour systems. In the 1980s, Ball (1987, 1988) conducted a piece of widely cited research on labour among farms in Shropshire, Herefordshire, Staffordshire and Clwyd, Wales. His findings on the use of agricultural contractors have already been mentioned (section 2.3.4). This was part of a wider trend, Ball argued, for farmers to replace full-time staff with more flexible forms of paid labour. He described a certain rigidity in permanent employment, observing that: "Working with such a labour force, a farmer or grower is unable to avoid either under-employment during off-peak periods or, even more crucial, under-capacity during peak periods" (Ball, 1987:143). A similar risk of off-peak under-employment was observed by Greenhalgh (2010) when interviewing livestock farmers in New Zealand. One farmer said his farm had created jobs just to keep permanent workers busy during quiet periods.

Greenhalgh highlighted that the livestock farms' flexible employment strategies were driven by financial reasons. Another respondent told her, "he would rather pay [a casual worker] $25 an hour for a defined job that achieved exactly what he wanted, than deal with the problems and costs associated with a permanent employee" (ibid., p.156). The corrective action – documented by Errington and Gasson (1996) and others – is to reduce the use of permanent full-time workers in favour of flexible alternatives, so that farms avoid the cost of employing under-utilised labour. Farms can then increase their use of paid labour when needed either by extending the worker's hours or by hiring temporary workers.

In his study, Ball (1988) asked farmers how they adjusted to seasonal fluctuations in labour demand. The most common strategy for increasing labour-input was to increase overtime for existing staff (Table 2.8). This would be model B of Figure 2.4 and scenario B of Figure 2.5. However, Ball found that if the existing workforce could not meet the labour demand or if specialist skills were needed, then farmers would seek additional labour through seasonal workers, contractors or family members, or by exchanging labour with another. Thus, in some circumstances, being able to access additional labour was crucial for the farm's coping strategy.

Table 2.8. Farmers' methods for meeting short-term fluctuations in agricultural labour needs, identified by Ball in 1981
Compiled from data in Ball (1988)

Method	Total number of times mentioned by respondents	% of total mentions
Increase overtime for regular workers	136	29%
Use outside agricultural contractors	120	25%
Hire seasonal labour directly	93	20%
Get family help with workload	86	18%
Share labour with other farms	37	8%
Total	472	100%

In another publication, Ball (1987) made a key point: if farms do not have access to flexible labour, then overtime is their only means of flexibility. It should not be assumed, following Kautsky, that it is only family members who are susceptible to over-work. Paid staff and contractors, too, can work very long hours – and are not necessarily paid overtime. Webster et al. (2008) described one such case in their study of UK dairy farms:

> "There is one Polish worker who also lives on the farm. With no other pressures on his time (i.e. no social life off-farm) it was possible for him to provide 'excess' input into farm labour. It was noted that this was at minimal cost to the farm business."

Farming's potential and actual exploitation of workers who live on site has been well documented. In extreme cases, they do not have the means to leave the job or the site, and work under conditions of forced labour (Deakin, 2016).

Versatility versus specialisation

In Atkinson's model of the flexible firm, some forms of numerically flexible labour can also provide functional flexibility. This could be a multi-skilled worker who is employed seasonally or part time, for example. In practice, parts of the literature suggest that achieving high levels of functional flexibility does not always occur when using paid, non-family labour in farming. The quality of individual workers to perform a diverse range of tasks is defined by Malanski et al. (2019) as versatility. It has been argued that non-family paid workers might be less versatile than family members. Firstly, at an individual level, certain types of flexible worker such as seasonal labourers might be less skilled than more expensive and permanent forms of farm labour (Errington & Gasson, 1996). Secondly, at the business level, functional flexibility goes against the idea of labour specialisation. Arguably, when workers are versatile and can be easily reallocated from task to task, it detracts from the potential of the farm as a whole to benefit from highly specialist systems or divisions of labour. The theory that labour specialisation improves labour productivity is long established in the economics and organisational literature (Malanski et al., 2019). There is an argument that using paid labour allows for greater division of labour than with family farms (where people must all do a little of everything), which ultimately benefits labour productivity (Kloss, 2017).

Based on the theories presented above, the converse business risk of employing specialist workers is that they create over-employment in the workforce because at times when they are not needed for their specialist tasks, they cannot be redeployed. This might be a concern for large farms, since the roles of individual workers tends to become more specialised as farm operations and workforces get larger (Harrison & Getz, 2015). However, it is possible that peripheral workers who are employed for a particular task can be redeployed, if the alternative tasks are not too skilled. For example, *Midland Farmer* magazine featured a mixed estate in Herefordshire which employed seasonal fruit-pickers for its horticulture enterprise. The farm manager explained that simplifying the arable cropping system had enabled the farm to reduce its permanent workforce, by not replacing staff who had retired. The remaining workforce was largely able to manage the arable workload, but there were still peaks in labour demand for tasks such as weed control. The estate coped with these peaks by 'borrowing' some of the seasonal fruit-pickers (Tasker, 2018). This strategy could benefit multi-enterprise or mixed farms. It might not be ideal that there is enough slack in the system that the workers can be redeployed, but this it might be unavoidable on occasions such as inclement weather or slow ripening when workers would not be able to work at all if they were not redeployed.

One aspect to consider is that when workforces become stretched, workers spend more time working alone (Malanski et al., 2009). Therefore, farms operating with small workforces and/or under conditions of over-employment might need to have workers who are already trained or experienced, and do not need supervision. This also has implications for worker wellbeing and health and safety, as discussed in section 2.3.3.

2.4.3 Resilience

Some further ideas on the capacity of farm labour systems to adjust to changing workloads are found in the literature on resilience. This field of work is concerned with the capacity of farm systems to withstand shocks and to adapt without becoming radically different systems (Pomerory, 2015). Over time, farms must cope with sudden shocks, such as the loss of a family member, as well as more gradual changes, which could include changes caused by new production standards (Darnhofer et al., 2016).

Studies have suggested that flexibility is an important component of resilience (Darnhofer et al., 2016). Flexibility could be achieved in various ways with various implications for labour. One form of flexibility observed by Darnhofer (2010) among family farms in Austria is the capacity to adapt and reallocate farm resources, which could include labour, to make changes to the system or try new activities. The farmers valued this kind of functional flexibility as a survival strategy. It suggests a preference for using existing labour sources rather than pay for additional labour.

Another form of flexibility observed by Greenhalgh (2010) of beef and sheep farmers in New Zealand involves using flexible labour to minimise production risk in unpredictable market and weather conditions. "For example," writes Greenhalgh, "it is easier to delay the subdivision of paddocks if the proposed fencing is to be done by a contractor rather than a permanent employee" (ibid., p.149).

It could be argued that diversification provides a further kind of flexibility, and thus resilience. The farmers above used strategies of income diversification within the farm business and/or through off-farm employment (Darnhofer, 2010; Greenhalgh, 2010). A quantitative study of beef and sheep farms in Northern Ireland also found that off-farm income helps them to survive (Jack et al., 2009). Talbot's (2015) study of Welsh livestock farmers who had diversified into tourism found that diversification sometimes enabled farmers to reinvest the proceeds into farming, although it did not necessarily reduce their dependency on farm subsidies. Talbot also found that the third most popular reason for diversification, after generating income and making use of existing facilities, was to create employment for family members who were under-worked or who wanted to return to the farm. Reminiscent of cases of farmers participating in an AES to create compensated work for family members (see section 2.2.2), this phenomenon points to the possibility of surplus or under-employed family labour on farms, or to Chayanov's scenario of families needing to create more earning opportunities as they grow.

Darnhofer et al. (2010) noted that while diversifying farm enterprises and off-farm employment help to spread income streams and provide stability, they might spread resources too thinly to specialise in an area of strength. They argue that qualities which help a farm to absorb or adjust to shocks may be different from qualities which help a farm to maintain operations or exploit new opportunities. In further research conducted in Austria, farmers described the negative impacts of pursuing a diversification strategy, notably a heavy workload (Darnhofer & Strauss, 2014:1782). Some farmers also reported that after diversifying, they were less able to attend properly to each enterprise or task; labour productivity suffered. This finding chimes with the theory that specialisation increases labour productivity (see section 2.4.2.3).

Section 2.3.3 above showed that in some UK farming sectors, the use of wage labour relative to family labour is very low or has continued to decline in recent years. We noted examples from upland farming where farms had cut back staffing to become almost wholly family-labour operations. Pomeroy (2015) frames such behaviour as a coping strategy used by resilient farms. She describes beef and sheep hill farms in New Zealand which survived crises of deregulation and drought (see Appendix 6) when others did not. These types of farm already used little full-time wage labour before the crises, but Pomeroy observes that the resilient farms had further reduced their use of agricultural contractors and of neighbourly assistance. Some of the farms that survived had acquired land to provide enough work for sons and daughters who had joined the farm labour force, but in some cases the farmer continued to farm alone, benefiting from new technology. "Today, 25 (38%) of the farm owners do not even employ fencers or shearers, but own their own equipment and do all farmwork themselves" (ibid., p.154). Operating without paid labour, said Pomeroy, means that "farmers have considerably more flexibility in dealing with poor prices and poor seasons" (ibid., p.157). Pomeroy found that, in contrast to other studies on resilience, most of the farms did not rely on off-farm employment for their survival.

Dairy farming tends to be more labour-intensive than grazing livestock operations, as we saw above, and thus a strategy of shrinking the labour force to a very small amount of family labour might not be possible. A study of dairy farms in New Zealand found that those with resilience in the sense of having capacity to buffer shocks (measured in farm liquidity, efficiency and solvency) have high labour productivity in milk produced per labour unit (Shadbolt et al., 2017).

Linking to the production system

Based in France, the researchers Hostiou, Dedieu and colleagues have extensively studied the labour systems of livestock farms in several country contexts. They are interested in how farmers organise the work done on the farm, marrying the available workforce with the work needed and any desire the farmer may have to free up time for off-farm engagements or family (Madelrieux et al., 2009; Cournut et al., 2018; Hostieu & Dedieu, 2011).

A valuable feature of the work by this group of researchers is the way in which they emphasise that labour and labour organisation are inextricably linked to the livestock production system. In their research they observe how crucial aspects of housing, milking, breeding, lambing or calving, grazing and feeding can affect the amount of daily routine work required, and the predictability and duration of different periods of work over the farming year (Cournut et al., 2018). A farm's organisation of work at any one time is a function of the workforce, the livestock management system and the farm's equipment facilities or degree of mechanisation (Figure 2.6) (Hostiou & Dedieu, 2011).

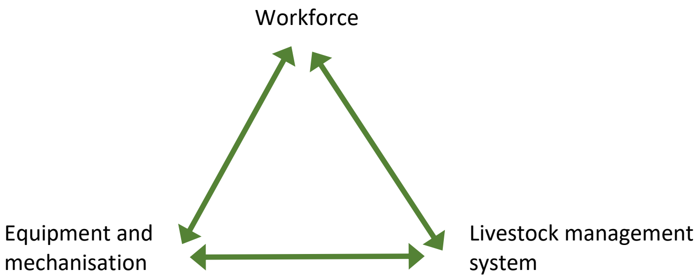

Figure 2.6. The three factors of a farm's 'work organisation'
Created by author from description in Hostiou and Dedieu (2011)

Accordingly, in their work among French dairy farmers, Hostiou and Dedieu (2011) showed that farmers do not only demonstrate labour flexibility by adjusting aspects of the workforce, for example by delegating tasks to contractors or reducing off-farmwork at peak farming times. Farmers also adapt their workloads by mechanising certain processes or making their livestock production systems simpler or more seasonal (see also Hostiou et al., 2020). Examples from France included moving from year-round to block calving, moving to once-a-day milking or using equipment to feed rations to housed cattle. Thus the scope of their conceptual framework is wider than numerical flexibility or functional flexibility within the workforce; it is about organisational or system flexibility more generally.

Farms that can change their set-up and to adjust the distribution of work to cope with seasonal peaks or unexpected crises may have better adaptive capacity (Dedieu, 2009). Organisational flexibility in this sense can also help farmers to free up time if they are unable to access external labour, need or prefer to manage without paid labour, or want a better work–life balance (Hostiou & Dedieu, 2011).

The work of this group of researchers reveals that the labour organisation of livestock farming systems varies along three axes:

- Labour specialisation versus versatility among workers;
- Autonomy within the core family unit versus use of wider sources of (paid) labour; and
- High levels of routine work versus daily and seasonal variability in work tasks.

This is all governed partly by economics, climate and the livestock production system, and partly by how the farmer chooses to do things. Where any one farm sits along these three axes could affect its flexibility and adaptive capacity. However, it seems there are trade-offs rather than inherently better or worse practices. Therefore the work of Hostiou, Dedieu and colleagues cannot definitely answer the question emerging from section 2.4.2.3 above, of whether enterprise diversification, functional flexibility and versatility are better or worse for productivity and resilience than focused enterprises and labour specialisation.

2.4.4 Overall findings on flexibility and stretchedness

Let us return to the starting question: are some farms better able than others to cope with changing and increasing workloads? The literature provides theories and evidence to support the argument that family-labour farms are well placed, because they have flexibility in how they direct their own labour and have reservoirs of family labour that they can call on if needed. However, it could also be argued that family-labour farms are already over-stretched from working long hours following retrenchment. Rather, it may be that the farms which employ paid labour can cope better – either farms with permanent full-time workers who provide some slack in the system, or farms with access to temporary or casual labour which can be quickly put to work or which leaves the farm owner time to work on additional paperwork or other management tasks. A coping strategy that suits a beef and sheep farm may not suit a labour-intensive dairy farm. It is also possible to argue for the benefits of functional flexibility, in the sense of having workers available who can be allocated to multiple tasks, or for labour specialisation, with clearly defined roles and divisions of labour.

Table 2.9 attempts a synthesis of these ideas, showing how three aspects of resilience – flexibility through diversity, flexibility through what we might call stretch, and resilience through productivity and efficiency – are achieved (according to the literature) at farm business, workforce and individual worker level.

Table 2.9. How three aspects of farm resilience are characterised at the business level, workforce level and individual worker level: a theoretical synthesis of the literature

	Aspect of resilience		
Level	**Flexibility through diversity**	**Productivity and efficiency**	**Flexibility through stretch**
Farm business level	Enterprise diversification	Enterprise specialisation	Enterprise scalability
Workforce level	Functional flexibility (capacity to reallocate labour) Numerical flexibility using flexible labour sources for any seasonal enterprises	Division of labour Permanent labour sources Numerical flexibility to cope with highly 'peaky' demand if a specialist single enterprise farm	Numerical flexibility (capacity to add labour) Capacity for lone working
Worker level	Versatile workers Temporary workers	Specialised workers Temporary workers or contractors	Workers who can work long hours and work unsupervised

3. Research design

This chapter describes the methodology of the study. Section 3.1 outlines the geographical and sectoral scope of the study and section 3.2 explains mixed methods research design and the stages of the project. Section 3.3 describes the methods used for secondary and primary data gathering and analysis, including a questionnaire survey and telephone interviews. A consideration of the ethics of the study is given in section 3.4.

3.1 Scope of study

3.1.1 Sectoral scope: livestock farming

The research objective did not lend itself to a particular place or group to be studied. In such cases, the researcher must decide how the study will be bounded (Bechhofer & Paterson, 2000). It was decided at the outset to focus on cattle and sheep farming. The study therefore excludes other farmed ruminants such as deer, as well as pigs and poultry. The study covers all major types of sheep and cattle farming: (1) dairy farming; (2) specialist upland and lowland farming of beef cattle and sheep; and (3) mixed farming where cattle or sheep are kept as part of a wider system. Setting these sectoral boundaries for the research is a balance between restricting the study to be manageable in a three-year timeframe, and retaining enough variation so that differences between different types of livestock farm could be explored.

3.1.2 Geographical scope: Herefordshire, Shropshire and Wiltshire

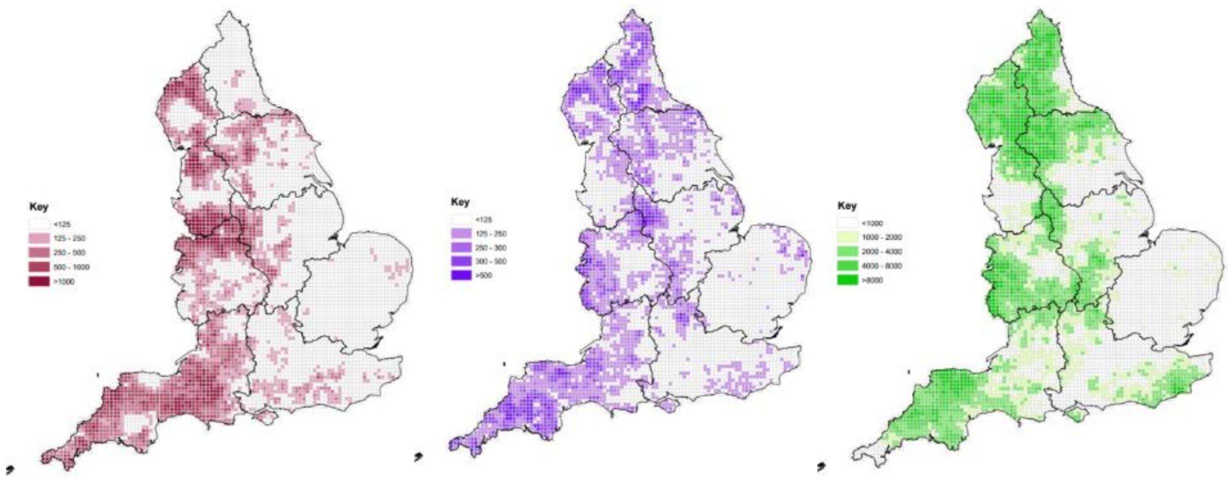

Figure 3.1. Distribution of numbers of dairy cattle (left), beef cattle (centre) and sheep (right) in England, 2010 Source: Defra (2020a)

Farms that keep cattle or sheep, henceforth referred to as *livestock farms*, make up the largest group of all farms in England. Most dairy cattle, beef cattle and sheep are farmed in the west and north of the country (Figure 3.1). Again in the interests of setting boundaries on the study, it was decided to focus on livestock farmers in certain parts of England for the primary data-gathering. The English counties of Herefordshire and Shropshire were selected first. They both have large numbers of livestock farms, including upland beef and sheep farms. Wiltshire was then selected as a contrasting region. Inadvertently, some farmers from the Welsh county of Powys were also included (Figure 3.2). Counties were chosen rather than a smaller study area such as a group of villages, because the study was intended to be more sectoral than geographical in orientation. To check that neither Herefordshire, Shropshire nor Wiltshire have been over-researched, a search of the agriculture literature was made in Google Scholar for various phrases, such as 'Farmers Herefordshire', '"farm assurance" Shropshire' or 'farm interview Wiltshire'.

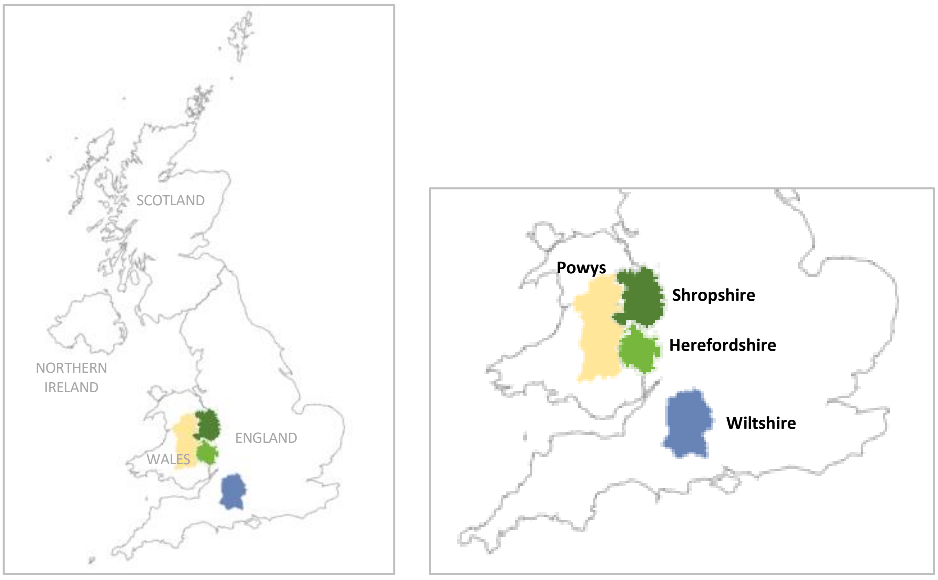

Figure 3.2. Research locations
Maps produced using Microsoft Excel, © GeoNames, HERE and MSFT

Herefordshire and Shropshire are part of the English region of the West Midlands, on the border with Wales. They are two of the most rural counties in England. In 2016, Shropshire had 3,919 farm holdings, accounting for 3.7% of all holdings in England. Herefordshire had 2,812, accounting for 2.6% (Defra, 2019a). Wiltshire is part of England's South West region. It is nearly as large as Shropshire but had fewer farm holdings (2,304) in 2016, representing 2.2% of all farms in England (Defra, 2019a). Powys borders Herefordshire and Shropshire in east Wales, and at 5,180 km^2 is nearly the size of both counties combined (Llywodraeth Cymru, 2018). Powys had 4,753 farms in 2016, or 19% of all farms in Wales (StatsWales, 2020).

Table 3.1. Number of farm holdings in Herefordshire, Shropshire, Wiltshire and Powys by type, 2016 Data sources: June Survey (Defra, 2019a; StatsWales, 2020)

	Cereals	General cropping	Horti-culture	Pigs and poultry	Dairy	LFA	Lowland	Mixed	Other	Total
Herefordshire	304	426	237	127	62	320	984	317	35	2,812
Shropshire[a]	487	681	71	115	315	543	1,273	389	41	3,919
Wiltshire[b]	502	326	/	/	198	0	917	218	21	2,304
England	19,118	17,728	4,259	2,495	6,470	12,559	32,369	8,833	1,059	106,853
Powys	55	11	117	250	149	3,249	145	186	591	4,753
Wales	381	158	735	1,475	1,764	11,929	2,477	1,061	4,546	24,526

England figures are reported for 'holdings'; Welsh figures are reported for 'farms'. The four farm types covered in the present study are highlighted. [a] Comprises Shropshire CC and Telford and Wrekin. [b] Comprises Wiltshire CC and Swindon.

June Survey data from 2016 show that the profiles of agriculture in the three English counties are different in some aspects from the English average – and from each other (Figure 3.3). Shropshire has proportionally more dairy and grazing livestock farms than England as a whole, and fewer horticulture operations. Herefordshire is known for its orchards and soft fruit, but has proportionally fewer general cropping, dairy and pig farms (Herefordshire had only 62 dairy farms in 2016). Wiltshire has close to the national average proportion of mixed farms, and more lowland grazing farms than either Herefordshire or Shropshire.

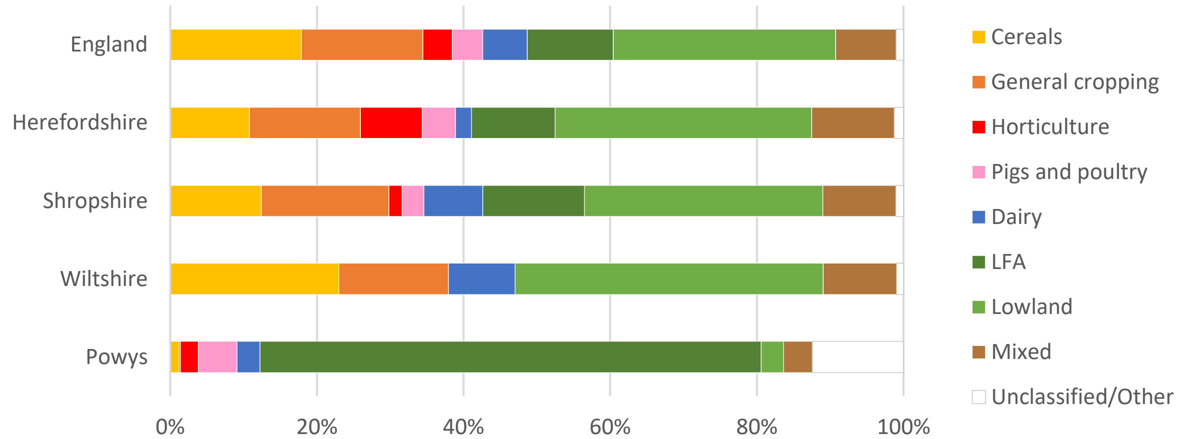

Figure 3.3. Proportion of holdings or farms by type, 2016
Data sources: June Survey (Defra, 2019a; StatsWales, 2020)

England, Herefordshire, Shropshire and Wiltshire rows show 'holdings'; Powys row shows 'farms'.
'Shropshire' comprises Shropshire CC and Telford and Wrekin. 'Wiltshire' comprises Wiltshire CC and Swindon.

Herefordshire and Shropshire both have upland farms in LFAs. The term 'Less Favoured Area' was introduced under the European Union to designate places where farmers face constraints on production and are eligible for income support. In the UK, it refers to upland areas, designated as Disadvantaged or Severely Disadvantaged. Shropshire has LFAs in the south-east and south-west of the county, and Herefordshire has a smaller LFA along the border with Wales. Powys has substantial LFAs in the east of the county (Figure 3.4). All but one of the farmers from Powys captured in the postal survey are in LFAs closed to the Herefordshire and Shropshire borders.

Defra classifies upland beef and sheep farms as 'LFA grazing livestock' farms. This is henceforth shortened to *LFA farm*, while 'lowland grazing livestock' is shortened to *lowland farm*. This is for the purposes of simplicity and does not disregard the fact that a small number of farms in LFAs have dairy cattle or cultivate cereals, and that some farms that are not designated as LFA holdings may have some land parcels in upland areas.

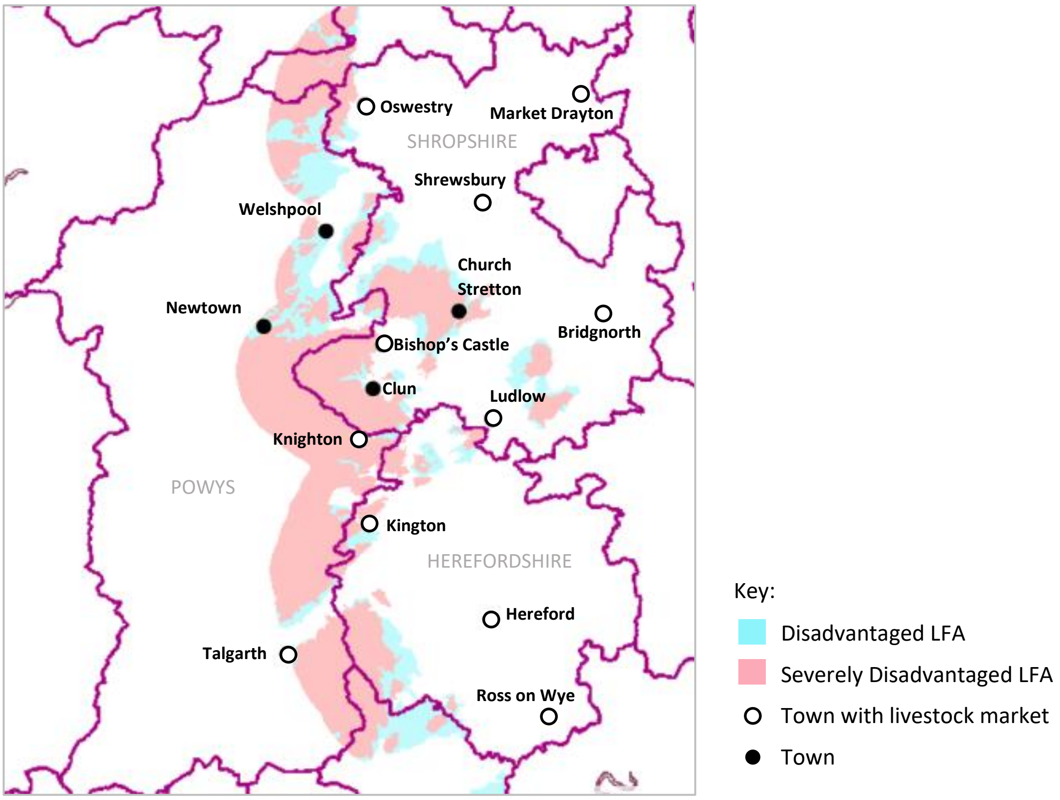

Figure 3.4. Less Favoured Areas in Shropshire, Herefordshire and Powys
Map produced using MAGIC Map (MAGIC, 2019), © Crown Copyright

Figure 3.5. Upland farming landscape in east Herefordshire Source: author

Figure 3.6. Mixed arable landscape in north Wiltshire Source: author

In Herefordshire and Shropshire, the distribution of farm holdings by size is similar to the overall distribution at English national level, whereas Wiltshire has proportionally more large holdings over 100ha and fewer small 20–50ha holdings (Defra, 2019a). Overall, livestock holdings are larger than the English average in Wiltshire, smaller in Herefordshire and below or around average in Shropshire (Table 3.2).

Table 3.2. Average size (ha) of commercial holdings by type and county, 2016
Data source: June Survey (Defra, 2019a)

	Dairy	LFA	Lowland	Mixed
Herefordshire	106	54	40	95
Shropshire[a]	126	66	38	119
Wiltshire[b]	180	N/A	63	206
England	129	101	43	106

[a] Comprises Shropshire CC and Telford and Wrekin. [b] Comprises Wiltshire CC and Swindon.

As well as providing a contrast to Herefordshire and Shropshire in farming systems, Wiltshire has some demographic and socio-economic differences. It is a more urban, less rural county, with faster rail connections to the capital London. Relative to Herefordshire and Shropshire, Wiltshire has a higher population density, fewer remote rural settlements and, when compared with Herefordshire but not Shropshire, a slightly higher unemployment rate and lower jobs density (Defra, 2011a, 2011b; Office For National Statistics, 2019a).

3.1.3 Unit of analysis

The primary unit of analysis for this study is a single farm business, or *farm*. Each farm has one or more production systems and farming enterprises, and some have diversified non-farm enterprises. Each farm also has a farm labour system, which is operationalised by a workforce. This is what is analysed in the study, even though a workforce is made up of individual people whose roles and opinions are explored. At a secondary level, the study also takes individual sectors and counties as a unit of analysis – for example, questioning the particular labour demands of dairy farming or the recruitment challenges experienced in Shropshire. The study could be considered cross-sectional in design (Bryman, 2015).

3.2 Approach

The research was conducted over three years. It can be divided into a planning phase and an execution phase (Punch, 1998).

3.2.1 Planning phase

The starting point was an interest in the broad topics of labour in agriculture and private-sector certification and compliance schemes, and in how the two intersect. To help the researcher move from a topic to a set of Research Questions, a range of academic and grey literature sources were studied. In addition, scoping discussions were held with farmers, researchers and other stakeholders in late 2018 and early 2019. They included: an Oxfordshire farm manager; a Wiltshire farmer; an Oxfordshire dairy farm adviser; researchers from the University of Gloucestershire and the Organic Research Centre; two farm business consultants; and a representative of GlobalGAP. This work helped to define the sectoral and geographical scope of the study, as discussed above. To become familiar with the proposed study areas, the researcher visited Herefordshire, Shropshire and Wiltshire. Trips included a visit to farms open to the public through Open Farm Sunday, attendance at farm visits organised by grazing and grassland discussion groups and a visit to Ludlow livestock market.

At the same time as the Research Questions were being developed, a conceptual framework was also being formed. Through some of the theoretical literature, ideas from the scoping discussions and the researcher's own worldview, a paradigm for the project began to crystallise. *Paradigm* refers to a set of assumptions about the social world and the research topic in particular (Punch, 1998; Agee, 2009; Doyle et al., 2009). The researcher was influenced by schools of thought in critical theory (discussed in Chapter 2.4 above), which included an interest in power relations in agricultural value chains. The researcher was also influenced by observations made during previous professional work about how farmers in other countries sometimes struggle to comply with the sustainability requirements of buyers. Readings on farm resilience and transition then provided theories for how individual farms might be adapting and responding to labour-related challenges.

The research paradigm is implicit in the focus and phrasing of the Research Questions (Agee, 2009). But it was possible to go further and build a conceptual framework for the study which included a model for how farm labour systems might function. This is a way of making the researcher's assumptions and theoretical influences more explicit. The conceptual framework is presented in Chapter 4 and includes a diagram and a set of three hypotheses. These hypotheses should not be understood in the sense of an experimental hypothesis which is used to test a predicted relationship between variables in quantitative data (Tully, 2004). Rather, the term 'hypothesis' is used here to mean a predicted answer to a research question (Punch, 1998); an educated guess based on the research paradigm. Although some academics argue that hypothesis testing is incompatible with the setting of research questions, according to Creswell and Creswell (2017) it can be useful to have both in a mixed methods study such as this. Formulating hypotheses for this study offered a way to express the conceptual framework in a concise way, in addition to the diagram (see Figure 4.2 in Chapter 4). The hypotheses relate to Research Questions 2 and 3 in particular – these questions were the most loaded with preconceived ideas and theories (Table 3.3).

Table 3.3. Link between Research Questions and hypotheses

Research Question	Hypothesis
1. What do the experiences of farmers in Herefordshire, Shropshire and Wiltshire tell us about the changing nature of work and labour systems in UK livestock farming today? a. What are the labour patterns of livestock production and marketing systems? b. How, if at all, are changes to production systems, farm businesses and routes to market affecting the nature of farmwork? c. How, if at all, are labour needs and employment patterns changing on livestock farms?	
2. What are the specific effects of external requirements, especially farmer requirement schemes, on workloads and the nature of farmwork?	1.Livestock farmers accept additions to their workload because they feel powerless to refuse and because they identify with a culture of working long hours and 'doing what it takes'.
3. How are livestock farmers allocating time and sourcing labour to manage their workloads? a. How stretched are livestock farm labour systems? b. Is there elasticity in farm labour systems to cope with changes in workloads and the nature of work? c. Is there a threshold or breaking point, which triggers farmers to respond to work-related pressures in a drastic way? Do external requirements ever lead to a trigger event? d. Are labour shortages hindering responses to changes in workloads and the nature of work?	2. Each farm labour system has some degree of elasticity. 3. The additional work involved in complying with external requirements or exploring alternatives could stretch the adaptive limits of the farm labour system by exceeding the capacity of the workforce and/or changing the nature of the workload, and force a change to occur
4. Which farmers are best or worst equipped to meet the changing nature of work and emerging labour needs in livestock farming?	

During the planning phase, the conceptual framework influenced the emerging Research Questions, and vice versa. The Research Questions were further modified as the project progressed, which is to be expected (Punch, 1998; Agee, 2009; Creswell & Creswell, 2017).

A plan for empirical data-gathering was then developed (Table 3.4). This plan was arrived at by starting with the Research Questions and selecting methods that would be appropriate for answering them. The research approach was pragmatic and focused on addressing the research problem (Leavy, 2017). As Punch argues (1998:20), “the methods that we use should follow from the questions we seek to answer”. It was decided that a combination of qualitative and quantitative methods was appropriate. The individual methods are summarised below and explained in more detail in section 3.3.

Table 3.4. Methods used to answer the Research Questions

Research Question	Method
1. What do the experiences of farmers in Herefordshire, Shropshire and Wiltshire tell us about the changing nature of work and labour systems in UK livestock farming today? a. What are the labour patterns of livestock production and marketing systems? b. How, if at all, are changes to production systems, farm businesses and routes to market affecting the nature of farmwork? c. How, if at all, are labour needs and employment patterns changing on livestock farms?	Literature review FBS analysis Survey Interviews
2. What are the specific effects of external requirements, especially farmer requirement schemes, on workloads and the nature of farmwork?	Analysis of requirement schemes Survey Interviews
4. How are livestock farmers allocating time and sourcing labour to manage their workloads? a. How stretched are livestock farm labour systems? b. Is there elasticity in farm labour systems to cope with changes in workloads and the nature of work? c. Is there a threshold or breaking point, which triggers farmers to respond to work-related pressures in a drastic way? Do external requirements ever lead to a trigger event? d. Are labour shortages hindering responses to changes in workloads and the nature of work?	Interviews FBS analysis
4. Which farmers are best or worst equipped to meet the changing nature of work and emerging labour needs in livestock farming?	Literature review Interviews

3.2.2 Execution phase

Primary data

The Research Questions required techniques of data-gathering and analysis that could probe farmers' experiences of farm assurance schemes and the dynamics that were theorised to lead farm labour systems to stretch or break. It was decided to use some qualitative techniques, since they offer ways to explore experiences and attitudes of research participants and to capture participants' perspectives on how events unfold (Creswell & Creswell, 2017). Semi-structured interviews were chosen as the main qualitative tool. It was planned to follow up interviews at a small number of farms by spending an extended period of time with members of the workforce to better understand their labour networks and the demands on their time. This plan was discarded because of the Coronavirus pandemic.

Following a mixed methods approach, it was also decided to precede the interviews with a questionnaire survey and some statistical analysis of the quantitative survey data. A survey was chosen for four reasons. Firstly, it would enable the researcher to reach a large sample of farms more cost-effectively than interviews alone. Secondly, the collection and analysis of quantitative data would help answer some of the Research Questions such as RQ1 on labour patterns of livestock production systems. Thirdly, because the study was not focused on a single location or group, there was no immediate way to access a cohort of respondents. Contacting farmers through a survey was identified as a way to create a pool of respondents who could be invited to interview. For this reason, it was decided to use a postal survey to reach (unknown) farmers and administer the questionnaire remotely. Fourthly, using a survey to collect descriptive data about the respondent's farm business would free up more time for discussion during the interview.

Secondary data

In addition to primary data-gathering, the research design included an extended review of additional literature to capture some of what is already known about requirement schemes in agriculture, how farm workforces are constituted and possibly affected by external schemes, and other pressures and challenges in livestock farming in England and the UK. Further, two pieces of secondary data analysis were planned. The first was an analysis of data from the Farm Business Survey for England. The purpose of this exercise was to gain an idea of labour-related trends in livestock farming at the national level and a background understanding that would help interpret findings from the questionnaire survey and interviews. The second source of secondary data was a selection of external requirement scheme documents. These were closely studied to help the researcher understand how external requirement schemes might affect farmers' workloads.

Analysis

As well as helping to craft the Research Questions and make explicit the theory-based assumptions of the researcher, the conceptual framework also gave structure and guidance to the execution stage of the research. It provided focus and a terminology (e.g. words and phrases from the resilience literature), which helped to bring some conceptual clarity and consistency in how the data were analysed and presented. The data were assessed and interpreted in reference to the concepts, ideas and assumptions of the framework, and in this way the framework acted as a kind of a lens (Agee, 2009), offering one way (of many) of making sense of the data.

Policy case studies

It was hoped that as well as considering how workloads and labour systems have been changing in the recent past, the study could be forward-looking and made relevant to the ongoing development of policies and standards in UK agriculture. This is embodied in Research Question 4, 'Which farmers are best or worst equipped to meet the changing nature of work and emerging labour needs in livestock farming?'. To help achieve this, it was decided to select two areas of livestock farming policy and assess how trends in those areas might affect labour needs in future, in a loose kind of scenario analysis. Selecting two contrasting policy areas as case studies would give focus to the work and should be manageable in the time available.

During the later stages of the literature review, two themes emerged which seemed to offer potential for exploring as policy case studies. One was the control and management of livestock disease, which was being driven forward by a range of public- and private-sector initiatives affecting both cattle and sheep enterprises. The other was the rising interest in regenerative grazing and rotational alternatives to set stocking. The sub-questions are: What are the time and skill requirements associated with them? What have been the effects on farm workloads and labour systems so far? Which farm labour systems seem best equipped to cope with likely policy developments in those areas in future?

The main data sources for the policy case studies were industry literature and webinars, and the telephone interviews. Some stakeholders were also consulted and/or interviewed.

3.2.3 Mixed methods design

Overall this is a mixed methods study. The quantitative survey and the statistical analysis of survey data took place before the qualitative interviews; because of this, it might be classified as a *sequential explanatory* kind of mixed methods research design (Hughes, 2016). Or it might be classed as a *convergence* mixed methods design, because although the quantitative and qualitative data were collected sequentially, the survey data were returned to and further analysed together with the interview findings during the interpretative phase of analysis (Doyle et al., 2009).

The study is mixed methods because it involves both qualitative and quantitative data and analytical techniques. However, the term *mixed methods* relates not only to a mixing of qualitative and quantitative data and methods, but also to the epistemological foundations of the study. A mixed methods approach can involve inductive and deductive elements (Leavy, 2017). There is an element of deductive theory testing in using the interviews and other data sources to assess the validity of the hypotheses of the conceptual framework in a livestock farming setting. During the execution phase, detailed hypotheses were also formulated to guide the statistical analysis. This involved selecting independent variables that were hypothesised as likely to have an association with the dependent variable being tested. For example, the variables of farm type, farm size and whether the farm is eco-extensive or not (see section 3.3.3.2) were selected to test their association with the number of people in the farm workforce.

However, the research design was also open to conceptual or empirical insights emerging from the questionnaire survey and interviews and the secondary data. When new ideas and patterns began to form through inductive reasoning, they were explored in subsequent interviews and cross-checked against the data to gauge how widespread and meaningful they were, and thus the thinking became less inductive and more deductive again (Merriam, 2009). For example, in Chapter 10 the researcher makes observations about how farmers cope with workloads, and uses that to draw conclusions about the importance of connectedness and to suggest three types of stretched or relaxed farms. These conclusions were at a finer level than the deductive model – they provide detail for how the deductive model works.

A summary of the stages of the study and a timeline of work are presented in Figure 3.7 and Figure 3.8, respectively.

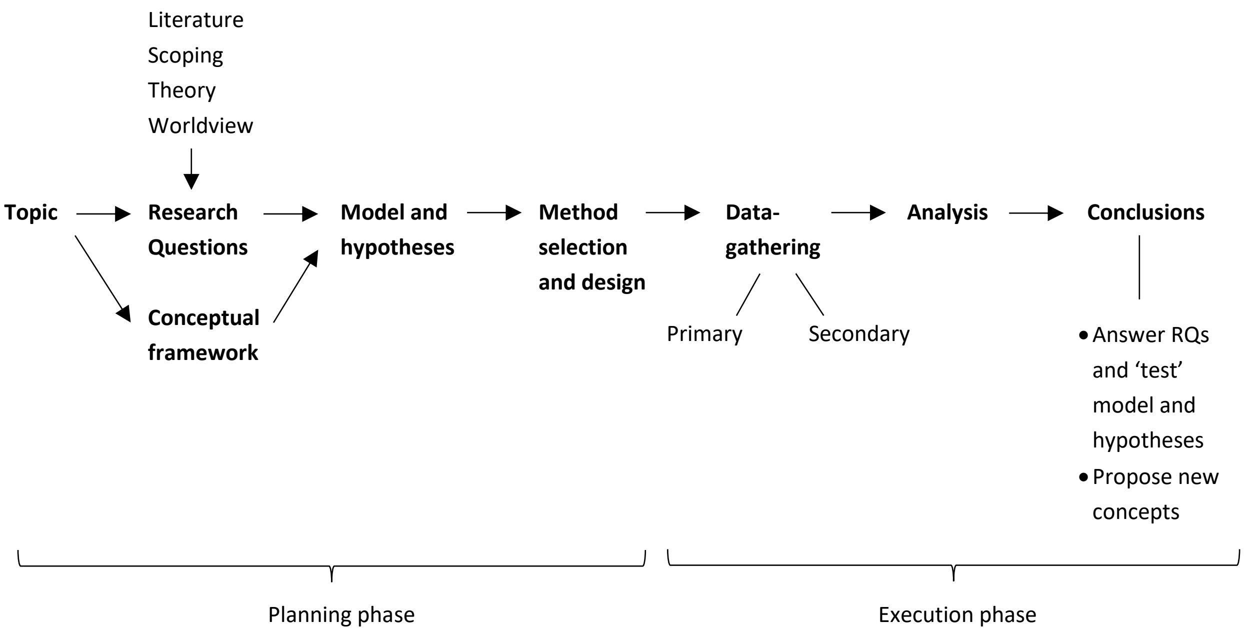

Figure 3.7. Stages of the research study
Adapted from Punch (1998:42), Figure 3.1

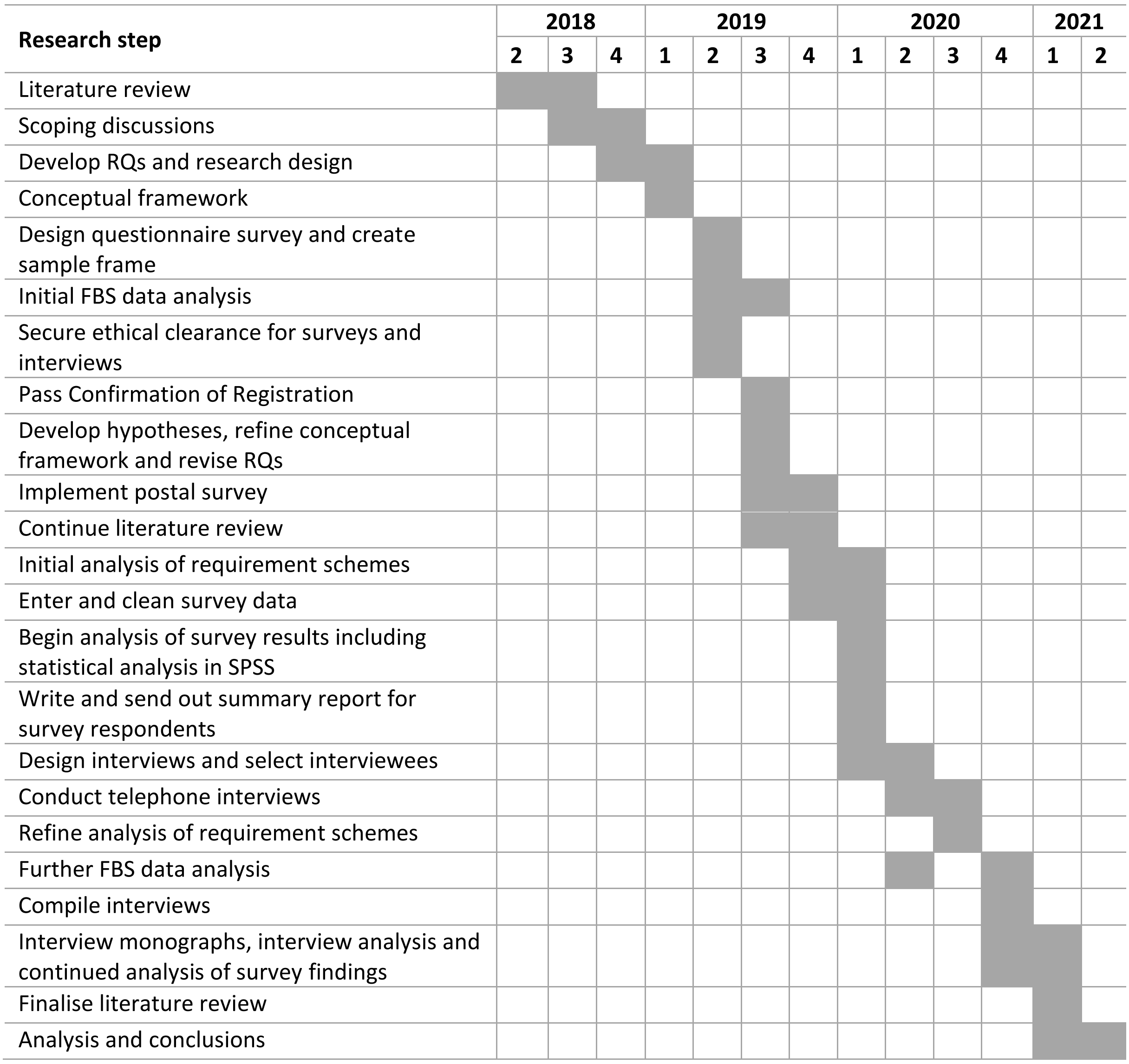

Figure 3.8. Timetable of research project

RQ = Research Question.

Notes: 1, 2, 3 and 4 refer to yearly quarters. Chart shows main periods of literature review, but literature was studied and consulted throughout the entire project.

3.3 Methods

3.3.1 Analysis of requirement schemes

This section describes the method used for the content analysis of external requirement schemes presented in Chapter 5. Ten requirement schemes were selected (Table 3.5). The first nine schemes were selected because they were publicly available and mentioned most often by respondents in the postal survey (see Chapter 8.1). The 10th scheme, Premium Cattle Health Scheme (PCHS), was not mentioned by any respondents, but it was selected so that a health scheme was included. PCHS is the most common cattle health scheme in the UK according to a 2018 survey of CHECS[3] members (CHECS, 2019b).

Table 3.5. Requirement schemes selected for analysis
Sources given in Appendix 1

Requirement scheme		Detail
For comparison across schemes		
1	Cross Compliance	Rules for England in 2020
2	Countryside Stewardship	Wildlife Offers agreements commencing on 1 January 2020, 'Mixed Farming'
3		Wildlife Offers agreements commencing on 1 January 2020, 'Upland'
4	Red Tractor	Dairy Standards. Version 4.2, updated October 2019
5		Beef & Lamb Scheme Standards. Version 4.1, updated June 2018
6	LEAF Marque	Version 15.0, issued 1/10/19
7	Pasture For Life	Certification Standards for Ruminant Livestock, Version 2.0, May 2020
8	Soil Association (organic)	Soil Association Farming and Growing Standards, version 18.4, updated on 30 April 2020
9	Arlagarden	Standards for Arla dairy suppliers, updated in January 2017
10	Premium Cattle Health Scheme (CHECS) (Johne's Disease)	Rules for Cattle Health Schemes: Johne's Disease Risk-Level Certification Programme (beef and dairy), September 2019
For comparing changes over time		
	Cross Compliance	Rules for England in 2005
		Rules for England in 2011
		Rules for England in 2015
	Red Tractor	Red Tractor Farm Assurance / Assured Dairy Farms, Dairy Standards, effective May 2010

Most of the schemes involve a single set of requirements that all participants must comply with, as long as they are applicable to the farm enterprise. Countryside Stewardship is different: it involves a menu of options that farmers select from. For the purposes of the analysis, options were selected to create a theoretical Countryside Stewardship agreement that a farmer might realistically participate in. So that the selection would be more likely to represent an actual case, two of the 'Wildlife Offers' under Mid Tier Countryside Stewardship were used, as they give

[3] Formerly known as Cattle Health Certification Standards.

farmers a narrower, pre-selected set of options to choose from. The exact rules that farmers must follow in a Countryside Stewardship scheme would be laid out in their agreement. In absence of this, the general requirements that are published for all agreement holders (Defra, 2019f) and the requirements that are published for each selected option (GOV.UK, 2021) were compiled.

The seven supermarkets selected are: Aldi, Co-op, Marks & Spencer, Morrisons, Sainsbury's, Tesco and Waitrose. UK supermarkets' requirement schemes for farmers that they source from directly are not publicly available. However, the supermarkets do publish online information about their commitments to sustainable sourcing from UK farmers, their requirements of suppliers, and their outcome measures or Key Performance Indicators. Information from the seven supermarket groups was duly obtained from the sustainability sections of their websites and from Google searches. These are listed in Appendix 1.

Identifying 'requirements'

Each scheme contains a set of rules, or standards. Some rules involve a single, simple requirement, such as rule 7.3.2 of the Pasture For Life scheme: "Where fields are cut for hay or silage, awkward field corners or whole margins should be left uncut". Other rules can be unpacked into multiple tasks. For example, Cross Compliance rule GAEC 1, "Establishment of buffer strips along watercourses", requires farmers to do three things: maintain green cover, manage the application of pesticides, fertiliser and manure, and produce a map. For a fair comparison across schemes, each rule was broken down into constituent requirements that were different from each other and would present to the farmer a distinct area of work. This is a subjective exercise and is a limitation of the methodology. The analysis included all requirements, including non-mandatory recommendations.

The analysis included all requirements for cattle, sheep and the general farm business. Rules that might only apply to a farm that grows crops, including fodder crops for livestock, were also included. Any rules for poultry, pigs, deer, water buffalo and forestry, however, were omitted. This means that the extent of requirements for single enterprise beef and sheep farms which do not grow crops may be over-estimated in the analysis, while the extent of requirements for multiple enterprise mixed farms with other species or forestry may be under-estimated. Each requirement was then assigned to a single topic (Table 3.6) and to one or more activity types (Table 3.7).

Table 3.6. Topic categories used for scheme analysis

	Livestock
1	Animal health, identification and disease control
2	Animal welfare
	Environmental sustainability
3	Biodiversity, wildlife and conservation
4	Inputs, nutrient pollution and water protection
5	Soil management
6	Energy and water use, contamination, greenhouse gases and waste
7	Extensive grass-based systems
8	Sustainable site operations
	Food safety and scheme compliance
9	Food safety and traceability
10	Scheme control measures and general compliance
	Social sustainability
11	Workers' rights
12	Community and heritage

Table 3.7. Categories of activity used for scheme analysis

	Activity category	**Notes**
1	Field operations	Includes: Cropping, grazing, land management, producing feed/fodder, in-field shelter and grazing platforms, protecting watercourses, field and farm boundaries, work on public access
2	Animal work	Includes: Checking animals, tagging, scanning, breeding, milking, how the livestock are managed, feeding, livestock transport, dealing with fallen stock, treating illness and disease, bedding, tethering and mutilation, enrichment, access to water indoors
3	Infrastructure, buildings and storage	Includes: Work on animal housing [including calf hutches], dairy parlour, farm buildings, water supply, storage, yard, pest (vermin) control
4	Machinery and equipment	Includes: Farm machinery, dairy machinery, livestock handling and feed systems, vehicle maintenance
5	Staff training and management	Includes formal staff training and review, but also requirements to ensure that persons are competent
6	Community engagement	
7	Processing and sales	Mainly relates to rules on ensuring segregation of certified produce and on using certification branding in sales and marketing material
8	Sourcing	Includes: Rules on permissible inputs, chemicals and other materials, livestock breeds
9	Experts	Requirements for an expert or certified service provider to be consulted or engaged
10	Management and control systems	
11	Admin	Includes requirements to: Develop a plan or policy Obtain a permit, licence or certificate Register or notify an authority or the scheme body Create or annotate a map Take a photograph Conduct a risk assessment or other kind of assessment, carry out monitoring, conduct a review, sward measurement Physical sampling, testing, Body Condition Scoring Keep records or documentation

3.3.2 Analysis of Farm Business Survey data

This section describes how secondary data from the Farm Business Survey (henceforth abbreviated to FBS for this section) were accessed and analysed.

The FBS is an annual farmer survey conducted by each devolved nation of the UK. The FBS for England covers a sample of 1,750 farms, which is stratified to represent most farm types, sizes and regions in England, including the four farm types with livestock (GOV.UK, 2014b). The least productive farms or smallholdings are not represented, since the FBS excludes all those with a standard output below EUR 25,000/year. The results are weighted to be representative of the population, but sampling error should be expected (GOV.UK, 2016). More information is provided in Appendix 5.

The participating farms are anonymised and full individual datasets are only available under licence upon application from the UK Data Service. Aggregated datasets are made freely available to researchers and the general public through the Data Builder service (RBR, 2021), which allows the user to access and download data for cross-tabulation of variables such as farm type, Farm Business Income and so on. This level of aggregation was suitable for the purposes of the present study and so a range of English FBS data were sourced from Data Builder. The selection of variables was guided by the following questions:

- Is there evidence that people who work on English livestock farms are working longer hours than in the past (e.g. because workforces have been reduced or because workloads from external requirements have increased)?
- Is there evidence for surplus labour and under-employment on farms, or for some farms' labour systems becoming stretched?

For example, one table downloaded from Data Builder showed the average hours worked by the principal farmer, broken down by farm type – dairy farms, mixed farms and so on. Another example shows the average expenditure on agricultural contractors by farms of different sizes. This process was exploratory and comprehensive; in all, over 300 tables were downloaded from Data Builder. Great use in particular was made of a set of labour-related variables which derive from questions in the survey concerning the farm workforce, such as 'Number of paid workers' and 'Time worked by spouse on farm business' (a full list of FBS variables is available at www.farmbusinesssurvey.co.uk/UserDocumentation/FBSCalcVariableList_tech.pdf).

The data were closely studied to identify empirical trends. It was decided that this method was sufficient without the need for formal statistical techniques of correlation analysis or regression, particularly since this exercise was intended to support the primary data-gathering rather than be the focus of the thesis. Where possible, data were compared over a 20-year time series, from

1998/99 to 2018/19, to identify long-term patterns. The same farms remain in the survey from year to year, with around 7% replaced annually (RBR, 2021). This could affect how comparisons of results from different years are interpreted.

3.3.3 Questionnaire survey

3.3.3.1 Design

The questionnaire was developed during summer and autumn of 2019.

Developing the questions

The approach to developing the questionnaire was to start with the Research Questions then break them down and unspool them into a set of more detailed data collection questions and variables (Punch, 1998) which would provide the data that would be needed for answering the Research Questions. This helped to ensure that the questionnaire and other research instruments were focused on the Research Questions and to avoid collecting unneeded data. Some of the data collection questions would need to be asked of farmers and others working on a farm or of other stakeholders; while the other questions could be answered from secondary data or from analysis of the new primary data.

To develop the survey questionnaire, the researcher took the data collection questions for farmers and others working on a farm, and divided them into (a) questions that seemed appropriate for those people to address using a self-administered questionnaire, and (b) more qualitative, open-ended, sensitive or complex questions that seemed more appropriate for asking in an interview setting. The first group of questions were then used and developed further to construct a questionnaire. It was already noted in Table 3.4 above that the survey was primarily used to collect data for Research Questions 1 and 2 – these concern a partly descriptive exploration of livestock farm labour systems and the possible effects of external requirement schemes thereon.

The plan was to collect descriptive data from the survey as well as to conduct statistical analysis of relationships between variables. The questionnaire was designed to collect some responses that would function as independent variables, such as farm type, size of farm or whether the farm had a diversification enterprise; and some that would function as dependent variables, such as whether the respondent had experienced difficulties recruiting workers or the respondent's opinion on farm paperwork. This was not fixed – a variable might be dependent or independent according to what relationship in the data was being studied (Punch, 1998).

Early drafts of the questionnaire were reviewed and refined by cross-checking the questions with information from the scoping discussions and the literature review.

Design principles

To minimise survey error and maximise response rate, the principles of Dillman's Total Design Method (Dillman, 2000) were followed. Measures included: providing an incentive to fill in the questionnaire, which was to offer to donate £1 to the Royal Agricultural Benevolent Institution (RABI) for every completed questionnaire; establishing the researcher's legitimacy, by sending the cover letter on University of Reading headed paper; gaining the respondents' trust, by clearly stating that responses would be confidential and anonymous; starting the questionnaire with simple questions; and avoiding overly complex questions that would be difficult to answer accurately.

Regarding the last point above – starting with simple questions – the survey was written so that it began with a section called 'Details of your business' where the respondent was asked to give basic information such as the size of the farm, farm enterprises (e.g. sheep, horticulture, arable), marketing channels and scheme participation. The next section, 'Your cattle and sheep farming systems', asked about aspects of grazing, housing and so on, which would largely serve as dependent variables. In order to decide exactly which livestock practices to capture in this section, the researcher identified aspects of British dairy, beef and sheep farming systems that, according to the literature and scoping visits and interviews, have the strongest influence on the level and type of labour required; see Table 3.8. (These are discussed in Appendix 7.)

Table 3.8. Aspects of livestock farming systems considered for inclusion in the questionnaire

Aspect	Coverage
Housing and/or outwintering	Included in questionnaire
Grazing regime	Included in questionnaire
Calving frequency	Included in questionnaire
Lambing frequency and whether indoor or outdoor lambing	Included in questionnaire
Milking schedule and use of robotics	Included in questionnaire
Herd or flock size	Removed from questionnaire; asked at interview stage
Rearing and finishing	Removed from questionnaire; asked at interview stage
Number and location of land parcels	Removed from questionnaire; asked at interview stage
Antibiotics use	Removed from questionnaire; asked at interview stage

The first two sections of the questionnaire were thus intended to ask relatively simple questions and to generate independent variables for comparing types of farm businesses and assessing possible correlations between farm characteristics and farm workloads. Many more characteristics about the respondent and their farm business could have been captured, but this had to be balanced with the need to keep the questionnaire short enough for people to respond to.

The questionnaire continued with sections on 'Paperwork', 'Your workforce' and 'Looking to the future'. These included questions that required a little more reflection on the part of the survey respondent, and were intended to generate more of the labour-related dependent variables such as how the farm workload has changed or the respondent's experience of labour shortages.

The questionnaire was worded using phrases that cropped up during scoping discussions and visits, and that seemed common in the trade literature (e.g. *Farmers Weekly*, AHDB reports, John Nix Pocketbook), so that the wording in the questionnaire would be familiar to respondents. For the questions in section 1 on the farm's enterprises, terminology from Defra's FBS and June Survey was used, again so that the wording would be familiar to farmers and so that the data would be compatible with Defra survey data. However, the Defra categories of 'Cereals' and 'General cropping' were changed in order to make a distinction between arable crops and/or field-scale vegetables with mechanised harvesting, and horticulture or orchards, requiring manual harvesting. This is because manual harvesting is more labour-intensive (see Chapter 2.3.1), which is relevant to the study.

As well as consulting the literature on conducting questionnaire surveys in the social sciences, the researcher looked at real examples used in UK agricultural research. One of them was a postal questionnaire used by Nye in 2016 for doctoral research into farm labour in the South West of England (Nye, 2017). The survey had been used twice before, in 2006 and 2010, for a long-term study of agriculture in the South West. However, Nye adapted it for her specific research aims, which were to assess the current situation of farm employment and consider the potential for the agricultural labour market to meet future needs of sustainable intensification. Because of the overlaps between Nye's research and the present study, the questionnaire was aligned with Nye's questionnaire where appropriate, particularly by using similar wording to describe types of worker and by ensuring that people who worked on non-farming diversification enterprises were captured in questions on the overall farm workforce. The questionnaire also referenced a doctoral survey used by Ball in 1981, which asked farmers how they coped with fluctuations in their labour requirements (Ball, 1988:125). This informed a question in the questionnaire concerning how respondents had dealt with any labour shortfalls.

Pilot

In autumn 2019, the questionnaire was tested face-to-face with four farmers:

1. Owner of an organic beef cattle enterprise in Oxfordshire;
2. Family partner of a mixed farm with beef cattle in Wiltshire;
3. Owner of an organic mixed farm with beef cattle in Wiltshire;
4. Owner of a dairy farm in Oxfordshire.

Although two of the farmers are from part of the study area (Wiltshire), there were no farmers from Herefordshire or Shropshire. It was not possible to persuade a farmer with sheep to pilot-test and the questionnaire was not pilot-tested with any upland farmers. Some authors advise the testers to be part of the same population from which the researcher intends to draw the sample (Bradburn et al., 2004), while Bryman (2015) recommends that the testers should not. The actual approach fits the advice of Gillham (2000), who suggests testing with 2 or 3 people from the target population, and 1 or 2 from outside it.

The farmers' feedback was used to revise the questionnaire further. The final questionnaire had 31 questions and was 6 pages long (see Appendix 2).

3.3.3.2 Sample selection

The scope of the postal survey was farm businesses in Herefordshire, Shropshire and Wiltshire with cattle or sheep. This covered farms as well as graziers who graze cattle or sheep on others' land. The objective was to identify 500 livestock farm businesses to which a copy of the questionnaire could be posted, with the hope of achieving a 20% response rate to generate 100 completed questionnaires. The 500 farms should include the four farm types in the same proportions as seen in counties as a whole, except that dairy farms would be deliberately over-sampled, as the literature review showed that dairy is an important livestock sector to study in terms of labour scarcity and participating in private-sector requirement schemes (see Chapter 2.2). The decision of the size of the sample (target 500) was governed by: available budget for the cost of the survey; anticipation of a low response rate of 20%; and the objective of generating a sample with sub-groups which would be large enough for statistical techniques.

It was not possible to obtain from public sources a comprehensive sampling frame that covered all such farms. It was therefore necessary to build a list of farms and sample from it. First, the number and proportion of farm holdings in Herefordshire, Shropshire and Wiltshire which are classified as dairy, LFA, lowland or mixed farms were obtained from the June Survey (Table 3.9). A farm list was then compiled using a wide but incomplete range of sources (Box 1), including a list of 1,000 randomly selected farms purchased under licence from Prospect 360 and the list of registered dairy establishments published by the FSA on 1 September 2019 (FSA, 2019).

Table 3.9. Number and percentage of selected farm types in Herefordshire, Shropshire and Wiltshire, 2016 Data source: June Survey (Defra, 2019a)

	Herefordshire		Shropshire[a]		Wiltshire[b]		All three counties		England	
Dairy	62	4%	315	13%	198	15%	575	10%	6,470	11%
LFA[c]	320	19%	543	22%	0	0%	863	16%	12,559	21%
Lowland	984	58%	1,273	51%	917	69%	3,174	57%	32,369	54%
Mixed	317	19%	389	15%	218	16%	924	17%	8,833	15%
Total	1,683	100%	2,520	100%	1,333	100%	5,536	100%	60,231	100%

[a] Comprises Shropshire CC and Telford and Wrekin. [b] Comprises Wiltshire CC and Swindon. [c] There are no LFAs in Wiltshire.

The type of each farm was estimated. A particular challenge was to discern if a farm had cattle or sheep. This was attempted by:

- Including some farms identified from cattle or sheep livestock auction catalogues (Appendix 3);
- Cross-checking with business listings (Yell.com, 192.com, Scoot and Thomson) to see if the farm was included and if so, under what description;
- Searching online for evidence that the farm had cattle or sheep (e.g. farm website; description of farm on Open Farm Sunday website; mention of farm in local farming press; planning application document; mention of farm on a sheep or cattle breeding society website).

This process is likely to have biased the sample towards farms that sell at auction and farms that have some kind of internet presence.

To estimate if a farm was an LFA farm, the farm's postcode was entered into the MAGIC website to see if it fell within an LFA (MAGIC, 2019). If this was not clear, the website Farmsubsidy.org was used to see if the farm had received LFA subsidy payments in the past.

An attempt was made to identify if each farm was 'eco-extensive' or not. The term *eco-extensive* is used in this study for any farm whose production system is certified as extensive and agro-ecological, which covers organic certification, Pasture For Life and Free Range Dairy. It was decided to over-sample eco-extensive farms in relation to the proportion of organic farms that exist in the study areas, for the same reason that dairy farms were over-sampled: the literature review showed that organic operations, and other low-input extensive systems, are distinctive for their labour demands and employment generation (see section 2.3.5).

The final list contained 2,344 farms and graziers. Each was assigned to a bucket, which was a combination of the farm's county, its estimated type and whether it was eco-extensive. Target sizes for each bucket were calculated in order to reach a total of at least 500 and achieve a proportional representation of each bucket, after adjusting for an over-sampling of dairy farms and eco-extensive farms. Farms were then selected from the list for the sample. If the bucket contained surplus farms, entries were randomly selected using the RAND () function in Microsoft Excel. In total, 521 farms were selected.

Box 1. Sources used to build farm list

Prospect 360 list of 1,000 ‘Mixed’ and ‘Livestock’ farms (random sample, purchased under licence)

Food Standards Agency list of registered dairy establishments

Livestock auction catalogues. See Appendix 3 for details

List of organic farming producers at 31 December 2016, released by Defra in 2018

Open Farm Sunday website (https://farmsunday.org/)

Pasture For Life website (www.pastureforlife.org/)

WWOOF website (https://wwoof.org.uk)

Stakeholder website (e.g. Clun Forest Sheep Breeders Society website, Wye Valley AONB website)

Press articles

Google or Facebook

Personal contacts

When the questionnaires began coming back, it was clear from the responses that some farms assigned to Herefordshire or Shropshire were actually in Wales. A list of Powys postcodes was obtained and all of the farms in the list with a ‘Powys’ postcode had their county changed to neighbouring Powys. This affected 16 eligible questionnaires: 10 that were previously labelled as Herefordshire and 6 as Shropshire.

3.3.3.3 Mail-out

The questionnaire was posted to the 521 selected sampled farmers between 9 and 15 October 2019. A small number were sent by email. The covering letter emphasised that the questionnaire should only be filled in if the farm had cattle or sheep, and asked the respondent to return the questionnaire by freepost with a note of ‘no cattle or sheep’.

The front page of the questionnaire suggested that “The questionnaire should be filled in by the farmer, farm manager, partner or someone else with a good overview of the whole farm business”. This created the possibility that the questionnaires would be answered by a range of people who vary in their roles, knowledge and power within a farm business. Being unable to specify who within a farm business or household should answer the questionnaire is a limitation of postal surveys (Groves, 2009).

Following Dillman's method, measures were taken to maximise the response rate such as posting the questionnaires in white envelopes with a real stamp, and providing pre-paid envelopes for the respondents to return them.

Replies were received over a period from 14 October 2019 to 14 January 2020. To thank the respondents and provide feedback, a report containing preliminary findings was sent to each participating farmer in March 2020, and a donation of £249 was made to RABI.

3.3.3.4 Response

Of the 521 questionnaires sent out, 259 were returned, giving a response rate of 50% (Table 3.10). This compares with a response rate of 30% achieved by researchers in a 2016 postal survey of farmers in South West England (Nye, 2018). Twenty-nine of the respondents were farmers who did not fill in the questionnaire as they did not have sheep or cattle or otherwise declined to participate; one envelope was returned by Royal Mail as undeliverable. This left 230 useable questionnaires, representing 44% of the sample. The other 262 questionnaires were not returned.

The farms which were presumed *ex ante* to be eco-extensive had a higher response rate (60%) than non-eco-extensive farms (47%). Thus not only were eco-extensive farms over-sampled, their proportion increased further because of their high response.

Table 3.10. Response rate of postal survey

	Sent	Received back	Response rate	Ineligible	Ineligibility rate of those received back	Eligible responses	Eligible responses as % of total sent
Herefordshire	191	90	47%	11	12%	79	41%
Shropshire	210	100	48%	11	11%	89	42%
Wiltshire	91	52	57%	7	13%	46	51%
Powys	29	17	59%	1	6%	16	55%
Total	521	259	50%	30	12%	230	44%

Over two-thirds (69%) of the eligible questionnaires were returned after the first mail-out, and a further 72 (31%) were received after a reminder (Table 3.11).

On average, respondents answered 97%, or 29.9, of the questions.[4] The respondents who needed to be prompted with a reminder tended to be less forthcoming than the respondents who responded after the first mail-out. They answered slightly fewer questions on average (95% versus 97%) and were less likely to answer the questions which asked them to elaborate if they answered 'Yes', as opposed to the simple tick-box questions. However, although they were more

[4] This does not include questions for which there was no option to answer 'none'.

likely than the 'first mail-out' respondents to leave these questions blank, the prompted respondents were not more likely to answer 'No'. This provides confidence that respondents were not automatically answering 'No' to questions with a written component out of lack of enthusiasm, which would have created misleading response data.

Table 3.11. Responsiveness to first mail-out and reminder

	Eligible responses received after first mailing	% of all eligible responses	Eligible responses received after reminder	% of all eligible responses	Total eligible responses
Total	158	69%	72	31%	230
Herefordshire	58	73%	21	27%	79
Shropshire	61	69%	28	31%	89
Wiltshire	28	61%	18	39%	46
Powys	11	69%	5	31%	16
Dairy	41	71%	17	29%	58
LFA	24	62%	15	38%	39
Lowland	38	72%	15	28%	53
Mixed	47	67%	23	33%	70
Smallholding	8	80%	2	20%	10
Eco-extensive	32	76%	10	24%	42
Not eco-extensive	126	67%	62	33%	188

The 29 ineligible questionnaires comprised 26 (6%) of the 464 presumed non-eco-extensive farms, and a similar proportion (5%) of the 57 questionnaires sent to presumed eco-extensive farms. One of the ineligible returns was filled in but had to be excluded from the study because although the farm had cattle, the respondent could not answer for that part of the farm business. The other 28 questionnaires were returned uncompleted by respondents who declared themselves ineligible for inclusion. The most common reason given is that their farm had neither cattle nor sheep. Eight of the 18 farms whose respondents said they had no cattle or sheep were identified from a livestock auction brochure and two were identified from sheep breeding websites, which suggests either they had sold their only animals at auction or the wrong farm was identified from the information.

3.3.4 Statistical analysis

3.3.4.1 Preparing the data

The survey data were cleaned and prepared for analysis, using Excel and IBM SPSS Statistics 25. This involved: dealing with missing values from unanswered questions; creating derived variables and dummy dichotomous variables; and coding string variables to transform them into numerical variables for SPSS. Also, the farm type, geographical remoteness and estimated FTE were calculated for each farm in the survey.

Each farm was allocated to a Defra robust type (Table 3.12). All respondent farms with dairy cattle were categorised as 'Dairy', even farms with mixed enterprises which could potentially be classified by Defra as 'Mixed' depending on Standard Output. Farms with only beef cattle and/or sheep were categorised as 'LFA' or 'Lowland'. Defra's definition of an LFA holding is 50% or more of its total area is in an LFA (Defra, 2012). Without information about the farm business and the land parcels that it might be farming, it was necessary to use best judgement to decide if was likely that this applied to the farms in the survey.

Table 3.12. Allocation of Defra robust types to surveyed farms

Respondent's farm business	Equivalent Defra category	Category used for respondent
Dairy only	Dairy	Dairy
LFA only	LFA	LFA
Lowland only	Lowland	Lowland
Dairy and LFA	Depending on SO, could be: - Dairy - LFA - Mixed	Dairy
Dairy and lowland	Depending on SO, could be: - Dairy - Lowland - Mixed	Dairy
Mixed dairy and cropping/pigs/poultry (lowland)	Depending on SO, could be: - Dairy - Another category (e.g. Cereals) - Mixed	Dairy
Mixed livestock and cropping/pigs/poultry (LFA)	Depending on SO, could be: - LFA - Another category (e.g. Cereals) - Mixed	Mixed
Mixed livestock and cropping/pigs/poultry (lowland)	Depending on SO, could be: - Lowland - Another category (e.g. Cereals) - Mixed	Mixed
Mixed dairy, livestock and cropping/pigs/poultry (lowland)	Depending on SO, could be: - Dairy - Lowland - Another category (e.g. Cereals) - Mixed	Dairy

SO = Standard Output

Defra classifies farms based on the contributions made by farming enterprises to the total production output, or Standard Output. The questionnaire did not capture information on Standard Output, nor detail of particular crops grown. This means that the Defra farm type labels used in this study are imprecise estimates only. However, analysis of the data soon revealed clear differences between farm types, suggesting that it is a useful way to categorise respondents.

A category of *smallholding* was created to separate very small anomalous farms from the more conventional farms and prevent them from distorting the results. Two criteria were used: (a) respondents who defined themselves as smallholders in the questionnaire; and (b) respondents under 20ha who matched conditions of the self-reporting smallholders by not participating in a requirement scheme, and not selling to a supermarket or processor or cooperative.

The questionnaire asked respondents to report how many people had worked on the farm business in the past 12 months as full-time, part-time and seasonal or casual workers. This information was used to create a new variable which measured the size of the internal farm workforce. The standard measure is Full Time Equivalent, where 1 FTE is equivalent to one person working full time for one year, or 2,200 hours/year (Cristobal Rengifo Castillo, personal communication, 2 February 2021). The equivalent term Annual Work Unit (AWU) is used for the FBS.

Each type of worker was multiplied by a coefficient to estimate their FTE. For consistency, the coefficients were the same as those used by Lobley et al. (2006) in their 2004 study of organic and non-organic farms in England, with two amendments: (1) because Lobley et al. differentiated between casual and seasonal whereas the questionnaire captured 'casual and seasonal' as a single category, the middle value was used (0.33 – 0.125 = 0.205); (2) students and volunteers, which were not recorded by Lobley et al., were given the same FTE as a seasonal worker, 0.125 (see Table 3.13). Lobley et al. borrowed coefficients from Errington and Gasson (1996), but data from the Farm Business Survey suggest that these coefficients need updating. For example, part-time workers are given the coefficient of 0.5 FTE, but the 2017/18 Farm Business Survey found that across all farm types, the average part-time worker worked slightly less than 50% of full time: either a standalone 0.412 AWU based upon the average hours worked per year divided by 2,200 hours; or a relative 0.426 AWU as a fraction of the actual hours worked per year by full-time paid workers (2,129 hours). However, more information from the FBS would be needed to calculate coefficients for all worker types and to understand if and how individuals' hours should be pegged to the standard 2,200 hours/year.

Table 3.13. Coefficients used to estimate FTE of people who worked on the farm

	Full time	Part time	Casual or seasonal
Farm holder or business owner	1.00	0.50	0.205
Other family members	1.00	0.50	0.205
Employed farm manager	1.00	0.50	0.205
Non-family workers and staff	1.00	0.50	0.205
Students and volunteers	1.00	0.50	0.125

Once each farm's FTE was estimated, further calculations were conducted to estimate the farm's *relative* FTE, by comparing it with other farms in the survey dataset of the same farm type and a similar size in hectarage. The method for doing this is explained in Appendix 4.

3.3.4.2 Representativeness of survey

Frequency distributions from the dataset were compared with data from national sources to estimate how different the surveyed farms are from the wider population. This technique was used by Boatman et al. (2007). The national sources used are the June Survey and the Farm Business Survey (described in Appendix 5).

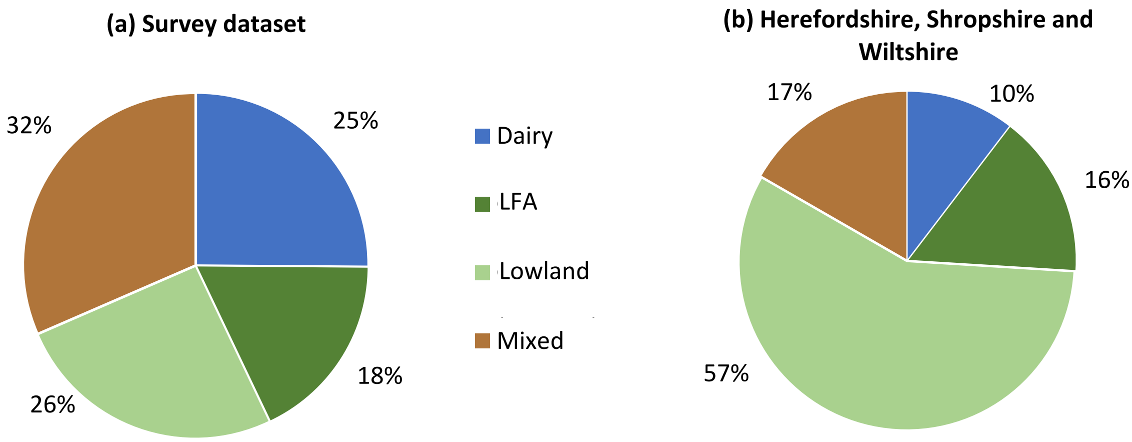

Figure 3.9. Breakdown of 230 survey respondents by estimated farm type (left), against breakdown of all commercial holdings in Herefordshire, Shropshire and Wiltshire by farm type in 2016 (right) Data sources: survey dataset and June Survey (Defra, 2019a)

Figure 3.9 shows that compared with all farms in Herefordshire, Shropshire and Wiltshire in 2016, the survey dataset has a higher proportion of dairy farms and mixed farms and proportionally fewer lowland farms, the latter perhaps because some of the respondent 'Mixed' farms would be classed by Defra as 'Lowland livestock grazing' if the arable crops that they grow are fodder crops (see Appendix 5). The proportion of LFA farms in the survey is roughly in proportion found in the whole of Herefordshire, Shropshire and Wiltshire in 2016. Thus the distribution of farm types within the survey dataset cannot be said to be representative of the population of farms in the target study areas. By county, the subset of respondents in Shropshire are closest to the actual distribution of all farms there in 2016. This is shown in the coefficients in Table 3.14 and Table 3.15. A coefficient of 1.00 would show that the survey sample is in the same proportion as in the population, but dairy farms have a coefficient much higher than 1.00 and lowland farms have a coefficient much lower than 1.00.

Table 3.14. Proportions of four livestock farm types within survey dataset, compared with all livestock farms documented in 2016 June Survey Data sources: survey dataset and Defra (2019a)

	Survey	Herefordshire, Shropshire and Wiltshire	Survey coefficient	England	Survey coefficient
Dairy	25%	10%	2.42	12%	2.07
LFA	18%	16%	1.14	23%	0.79
Lowland	26%	57%	0.45	49%	0.52
Mixed	32%	17%	1.89	16%	1.94

Table 3.15. Proportions of four livestock farm types within survey dataset by county, compared with all livestock farms captured by June Survey in each county in 2016
Data sources: survey dataset, Defra (2019a) and StatsWales (2020a)

	Herefordshire			Shropshire			Wiltshire			Powys		
	S	C	Survey coefficient	S	C	Survey coefficient	S	C	Survey coefficient	S	C	Survey coefficient
Dairy	18%	4%	4.21	27%	13%	1.92	41%	15%	2.41	6%	4%	1.56
LFA	14%	19%	0.67	20%	22%	0.87	0%	0%	1.00	75%	87%	0.86
Lowland	30%	58%	0.56	26%	51%	0.56	24%	69%	0.37	6%	4%	1.61
Mixed	38%	19%	1.81	27%	15%	1.59	35%	16%	1.88	13%	5%	2.51

S = survey dataset; C = whole county
Datasets used: 'County / unitary authority' (England); 'Robust farm type by area' (Wales)

The average farmed area of the farms in the survey (199.61ha, rounded to 200ha) is larger than the average area farmed by the selected four types in the whole of England in 2018, both for all holdings measured in the June Survey (72ha, 276% bigger) and for the smaller population of farms surveyed by the Farm Business Survey (153ha, 131% bigger).[5] Again, this result must be interpreted with caution as some of the issues that affected the farm type comparison apply here.

The survey dataset contains a disproportionately large number of eco-extensive farms. These farms skew the average farm size upwards, particularly because of an anomalously large organic lowland grazing farm among the respondents. The non-eco-extensive farms have a smaller average farmed size and a closer fit with the wider population data (Table 3.16).

[5] Note the discrepancy in the unit of assessment. The FBS reports the number of *farm businesses*, rather than *farm holdings* as measured in the June Survey. A farm business recorded in the FBS may have more than one holding. In 2017/18, the average farm business surveyed in the FBS had 1.2 'holdings'. Among the four selected farm types, this ranges from 1.1 holdings per lowland grazing farm to 1.3 holdings per mixed farm for all of England in 2017/18. It is not clear whether the farms in the survey would be considered 'holdings' or 'farm businesses'.

Table 3.16. Average farmed area of estimated farm types in survey, compared with June Survey and Farm Business Survey averages for selected farm types in England, 2018
Data sources: June Survey (Defra, 2019d); Farm Business Survey (RBR, 2021)

	Questionnaire survey	June Survey		FBS	
	Average (ha)	Average (ha)	Survey coefficient	Average (ha)	Survey coefficient
Eco-extensive farms in survey					
All four types	348	72	4.81	153	1.31
Dairy	199	134	1.49	159	1.64
LFA	133	107	1.24	177	0.65
Lowland	803	40	20.11	95	2.75
Mixed	271	104	2.61	180	1.15
Non-eco-extensive farms in survey					
All four types	166	72	2.29	153	1.08
Dairy	277	134	2.07	159	1.74
LFA	119	107	1.11	177	0.67
Lowland	87	40	2.18	95	0.92
Mixed	199	104	1.92	180	1.10

Survey data exclude 10 smallholdings. FBS data are for 2017/18

Based on the numbers from the June Survey shown in Table 3.1 earlier, the total sample including smallholdings represents 2.5% of all farm holdings recorded in the study counties in 2016 (Table 3.17). Powys is highly under-represented, as the 12 LFA farms are a small fraction of the 3,249 LFA farms recorded in that part of Wales. Taking only the three English counties of Herefordshire, Shropshire and Wiltshire, the survey sample represents 3.9% of all recorded holdings there. The best covered sector is dairy (capturing 9.9% of all recorded holdings, including 22.6% of all recorded dairy farms in Herefordshire) and the least represented is lowland grazing.

Table 3.17. Number of farms in survey as a percentage of all farm holdings of that type in 2016
Data sources: survey dataset; June Survey (Defra, 2019a; StatsWales, 2020a)

	Dairy	LFA	Lowland	Mixed	Total
Herefordshire	14	11	24	30	79
	22.6%	3.4%	2.4%	9.5%	4.7%
Shropshire[a]	24	18	23	24	89
	7.6%	3.3%	1.8%	6.2%	3.5%
Wiltshire[b]	19	0	11	16	46
	9.6%	/	1.2%	7.3%	3.5%
Subtotal England	57	29	58	70	214
	9.9%	3.4%	1.8%	7.6%	3.9%
Powys	1	12	1	2	16
	0.7%	0.4%	0.7%	1.1%	0%
Total	58	41	59	72	230
	8.0%	1.0%	1.8%	6.5%	2.5%

Survey sample includes 10 smallholdings, categorised as five mixed, three lowland and two LFA.
England figures are reported for 'holdings'; Welsh figures are reported for 'farms'.
[a] Comprises Shropshire CC and Telford and Wrekin. [b] Comprises Wiltshire CC and Swindon.

3.3.4.3 Statistics

Statistical analysis of the survey data was conducted in SPSS. The dataset contained a large number of independent and dependent variables. Most of the variables were nominal categorical variables (e.g. farm type, nature of workforce), but some were continuous (e.g. number of people in the workforce), dichotomous categorical (e.g. eco-extensive or not) or ordinal categorical (e.g. opinion on level of paperwork) variables.

First, simple univariate analysis of each of the main variables was undertaken, as recommended by De Vaus (2014) and Bryman (2015), by reviewing the distribution of answers for each variable in terms of their typicality, variation and symmetry. This generated a list of corrections for the data; for example, some outliers were excluded from analysis of some variables, and some variables were merged to avoid categories that were too small.

Next, simple bivariate analysis in the form of cross-tabulation was performed. The exercise was guided by the research questions and the variables were selected on the basis of hypotheses. For example, farm type was cross-tabulated with respondents' opinion on paperwork. From this, a note was made of any observed associations which seemed potentially significant and could be explored through correlation analysis or testing for strength of association (Punch, 1998).

The statistical significance of observed or hypothesised correlations between pairs of variables was then tested using methods appropriate to the nature and number of the variables, following guidance (Boslaugh, 2013; Pallant, 2016; Van den Berg, 2016; Medium.com, 2018). They were:

- **One categorical or dichotomous variable:** Pearson's chi square with Yates's Continuity Correction or Cramer's V. In some cases, the frequencies were very small. Here, Fisher's Exact Test was used (Boslaugh, 2013) – for example, to test the correlation between the 16 Powys farms in the sample and direct selling;
- **Two non-parametric or categorical variables:** Spearman's rho correlation coefficient and 2-tailed significance level;
- **Two continuous variables, or one continuous and one dichotomous:** Pearson correlation coefficient with Pearson 2-tailed significance level;
- **Group of variables:** Kruskal-Wallis significance level and Pairwise Comparisons;
- **Parametric variables:** Independent samples t-test (2-tailed).

Correlation was noted as significant at the 0.05 or 0.01 level.

For example, Research Question 3d is, 'Are labour shortages hindering responses to changes in workloads and the nature of work?'. This is addressed by the survey questions 'Have you had difficulties recruiting workers or contractors in the past 2–3 years?' and 'If yes, for which parts of the farm business is it most difficult to find workers or contractors?'. These were defined as independent variables (Punch, 1998). It was planned to cross-tabulate answers to these questions with dependent variables such as farm type and livestock system, which were collected from other parts of the survey.

3.3.5 Telephone interviews

3.3.5.1 Approach

During July–September 2020, telephone interviews were conducted with 34 respondents who had participated in the questionnaire survey. It had been planned to carry out in-person interviews of about one hour. The Coronavirus lockdown and rules on social distancing, which began in late March 2020, forced a change to this plan. Farmers were not approached until late June, after the most severe lockdown restrictions were lifted, for telephone interviews.

Because summer is a busy time for many farmers, and because capturing respondents' attention can be more difficult over the telephone (Irvine et al., 2012), the length of the interviews was limited to 30 minutes (unless the respondent clearly wanted to keep talking). This proved an acceptable time for the interviewees.

The interviewees were split into three groups, with the aim of covering slightly different themes in each group:

1. Group 1: general questions on paperwork, farm assurance, the farm workforce, possible trigger events and how 'stretched' the respondent feels;
2. Group 2: labour and time aspects of livestock disease management, plus general questions on the farm workforce (for Policy Case Study 1);
3. Group 3: labour and time aspects of regenerative grazing, plus general questions on the farm workforce (for Policy Case Study 2).

It was mentioned above that the questionnaire survey was primarily used to collect data relevant to Research Questions 1 and 2, concerning the nature of livestock farm labour systems and the possible effects thereon of external requirement schemes. Previously, it was also noted that the postal surveys were used to collect descriptive data about the respondent's farm business, so that this information could be recorded systematically and to free up time in interviews to talk about more subjective topics.

The telephone interviews were an opportunity to ask about the business and livestock farming systems in more detail and to ask the respondent in greater depth about how requirement schemes were affecting workloads on the farm – if at all. They were also a more suitable method for Research Question 3, which called for a qualitative approach to testing out the ideas of stretch and breaking points in farm labour systems.

Each interview was semi-structured (Punch, 1998). A list of open-ended questions was prepared in advance of each interview, tailored to each interview respondent. (Or rather, the questions were intended to encourage the respondent to talk freely, even if some of the questions were actually phrased as closed questions.) Similar questions were asked across interviews, to give some degree of standardisation.

The selection of topics and questions for the interviews was driven by the Research Questions and, more specifically, the set of data collection questions referred to in section 3.3.3.1 above which needed to be asked of farmers and workers but were not suitable for a questionnaire. These were adjusted to reflect the nature of the farm and the individual answers given by the respondent in the questionnaire. The 30-minute timeframe limited the questions that could be asked.

The interview questions typically followed this kind of sequence, with examples in italic:

1. Confirm and clarify details of the farm business

   How many sheep do you have?

   Do you grow fodder crops?

   What kind of diversification enterprise is it?

2. Paperwork and operational aspects of external requirements

   What is it about x *that you find most time-consuming?*

   Are there things in your herd health plan that you find difficult to comply with?

   Is the paperwork year-round or just at certain times of year?

3. The farm workforce

   How has the farm workforce has changed over time? Did you used to have paid staff?

   You mentioned difficulties recruiting people – can you talk more about that?

   Do you have specialist roles or do you all do a bit of everything?

4. Managing the farm workload

   What hours do you work?

   Are there certain times of year when you are particularly busy?

   You said that x *takes extra time. Where have you found the time to deal with it?*

   How do you manage indoor lambing without paid help?

   Can you tell me more about how your new handling system has saved you time?

   How did your workload change when you got out of dairy?

   Would you describe yourselves as 'stretched'?

   Have you ever got to a point where you've changed something?

5. Marketing, supply chains and local networks

    What is it like being in a Cost of Production contract?
    You mentioned getting advice from livestock markets. Can you talk more about that?
    You said that you didn't get any informal help from other farmers in the past year – has that always been the case?

For the two Policy Case Studies mentioned in section 3.2.2, eight of the interviews were focused on the topic of livestock disease management and control, and seven interviews were focused on intensive rotational grazing. Like the general interviews, these were also semi-structured, partly standardised and tailored to the individual respondent; but the questions were focused on the labour-related implications of a particular aspect of the farm business – that is, livestock disease management and control, and intensive rotational grazing, respectively.

Exploring change over time

The Research Questions entail some consideration of how livestock farm workloads and labour systems are changing over time. This was addressed in the analysis of requirement schemes by comparing successive versions of standards; and in the analysis of FBS data by comparing datasets from individual years. However, when it came to the primary data-gathering it was more difficult. The timeframe of a three-year doctoral study makes it difficult to employ a longitudinal research design, where farms could have been revisited after a long interval. And in the questionnaire survey, it was challenging to include questions that could capture how the situation on the respondent's farm had changed. This is partly because it would have made the questionnaire excessively long and complex to ask the respondent to provide information about the situation now in comparison with, say, five years previously; and partly because there were so many possible independent variables that might have influenced the changes that the data analysis would have become unworkable. After much drafting, the questionnaire included only three questions that attempted to capture temporal change. They are:

14. Have you made any significant changes to your farming system or marketing in the past 2–3 years which have increased your workload or your need for workers or contractors?
15. Have you made any significant changes to your farming system or marketing in the past 2–3 years which have decreased your workload or your need for workers or contractors?
18. Would you say that the amount of paperwork on the farm has changed over the past 2–3 years?

In the telephone interviews, it was easier to broach the topic of change over time. Firstly, respondents were asked to elaborate on their answers to the three survey questions above. More generally, in the course of the discussion it was possible to ask respondents to describe, for example, how the farm workforce had changed over the years, how the farm workload was affected when they sold their sheep flock or started direct selling, or whether recruiting paid workers had become easier or more difficult than in the past. Crucially for this study, it was possible during interviews to try to gauge how labour systems were functioning over time and to talk with respondents about times when a breaking point was reached.

Measuring workload

Nevertheless, the interview discussions about change were subjective and strongly influenced by the respondent's perceptions of events. A different research design with a larger and longer-term dataset would be needed to quantitatively measure any temporal changes in farm workforces and workloads, and then attempt to identify the causes of those changes, including a possible influence of external requirement schemes.

This relates to another point concerning how this study measures workload. During the interviews, respondents were asked to describe how many hours they work in an average day, perhaps at peak times and then at quiet times. This gave some quantitative evidence as to whether the respondent might be considered under- or over-worked, and by extension as to the 'stretched-ness' of their labour system, but it is only a partial measure of the hours worked by only one member of the respondent's farm workforce.

It might have been possible to design a research method which measured actual labour-time spent, but this would have needed to confront several difficulties:

1. *Who to ask.* If a principal farmer participates, they can state their own time spent. But they might not know the time spent by other members of their workforce, such as their spouse or workers. That leads to the question of whether multiple people on each farm would need to be involved in order to build up an accurate picture of total workload. For example, Gasson (1992) conducted research only among farmers' wives in order to assess the contribution that they make to the farm business.
2. *Accuracy.* If the method involves farmers estimating time spent, rather than recording it, how reliable are the farmers' estimates?
3. *How to measure.* Workload on a farm varies within the week, but also across the farming year. It must therefore be decided which time scale to measure. The Bilan Travail method (Petit et al., 2006) collects data for both, by asking farmers to estimate workload for typical days in each of the main periods of a farming year.

4. *Time needed for participants.* There are many aspects of a farm business, including paperwork, buying and selling, animal work, field operations, and so on, which can make measuring labour-time itself somewhat time-consuming. The researchers Hostiou and Dedieu (2011) took half a day to go through their QuaeWork method with each participant in their study of workloads on French livestock farms.

It is a limitation of the present study, perhaps, that such a method was not developed.[6] Instead, when the topic of workloads was discussed during interviews, the respondent was invited to give their subjective perception of how long tasks took and what were their busiest or least busy times. When later interpreting their responses, it was necessary to be mindful that the scoping discussions and literature review suggested that many farmers do not take labour requirements into direct consideration when deciding whether to adopt certain farming practices or join certain requirement schemes, and are unlikely to have measured how long certain tasks take or how many hours they work.

3.3.5.2 Selection and response

Survey respondents were asked at the end of the questionnaire if they would be willing to have a follow-up interview, and 113 said yes. From this sub-group, respondents were selected to approach, with the aim of interviewing at least 24. The selection was intended to be representative of the full 230 sample, with a proportional coverage of farm types, counties and eco-extensive and non-eco-extensive farmers. However, the farms in Powys were excluded. A small number of respondents were purposively selected to follow up on interesting comments they had made. The technique of selecting interviewees from the same sample as that previously surveyed is common in explanatory sequential types of mixed methods studies (Leavy, 2017).

The respondents from mixed farms with arable were approached first, anticipating that they would be busy with harvest later in the summer. Despite this, several respondents from mixed farms declined to be interviewed. Conversely, for many dairy and grazing livestock farmers, it was a relatively quiet period, as they were either just finishing weaning spring calves or were preparing for autumn calving. The final set of interviewees is broadly representative of the 230 survey respondents (Table 3.18) – however, as it relied on respondents voluntarily agreeing to

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[6] Several researchers have developed methods to measure farm workloads, and they tend to be participatory and long term or iterative. Pouloupoulou et al (2017) used a questionnaire for farmers to estimate their working time for certain activities, then carried out site visits to time tasks with a stopwatch. Fallon et al. (2006) provided farmers in Ireland with a timesheet to fill in on three consecutive days in each month, over a 12-month period. Reissig et al. (2016) asked women working on farms in Switzerland to keep a diary for a year and record their time every eight days. A method with close relevance to the present study is the QuaeWork tool devised by Hostiou and Dedieu for analysing the interactions between workforce, livestock system and infrastructure on farms in France. This method was designed to be used by agricultural advisers, not researchers, and comprised a semi-structured questionnaire which captured time spent on so-called 'set days' and both routine and seasonal work.

give their time for an interview, the group of 31 interviewees it is likely to include more gregarious or research-minded people than the sample as a whole, which itself was skewed towards the people who had the time and inclination to fill in the questionnaire.

Table 3.18. Breakdown of 34 respondents interviewed, compared with survey dataset

	General interviews	Disease-focused interviews	Pasture-focused interviews	Total interviews		Survey dataset	
Dairy	3	4	2	**9**	**26%**	58	25%
LFA	6	1	0	**7**	**21%**	39	17%
Lowland	8	1	1	**10**	**29%**	53	23%
Mixed	2	1	4	**7**	**21%**	70	30%
Smallholding	0	1	0	**1**	**3%**	10	4%
Herefordshire	11	1	2	**14**	**41%**	79	34%
Shropshire	7	4	1	**12**	**35%**	89	39%
Wiltshire	1	3	4	**8**	**24%**	46	20%
Eco-extensive	1	1	4	**6**	**18%**	42	18%
Not eco-extensive	18	7	3	**28**	**82%**	188	82%
Total	19	8	7	**34**	**100%**	230	100%

Figure 3.10 and Figure 3.11 show how the interviewees were derived from the original mail-out.

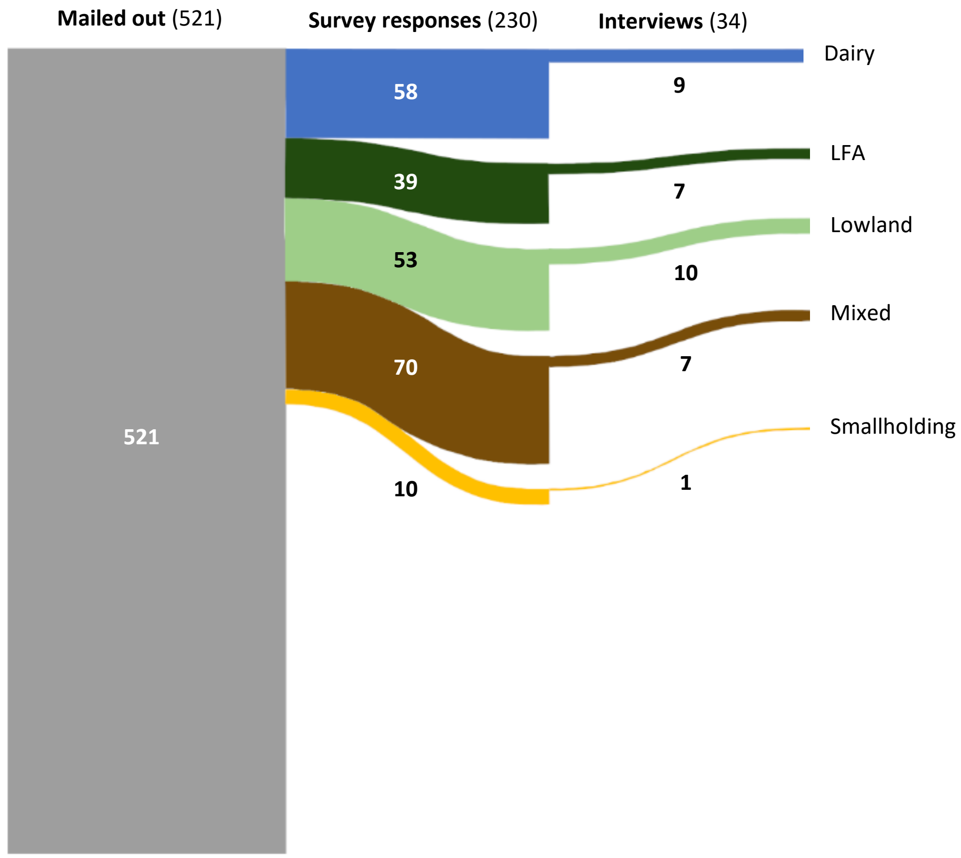

Figure 3.10. Derivation of survey and interview respondents from mail-out, by farm type Created by author

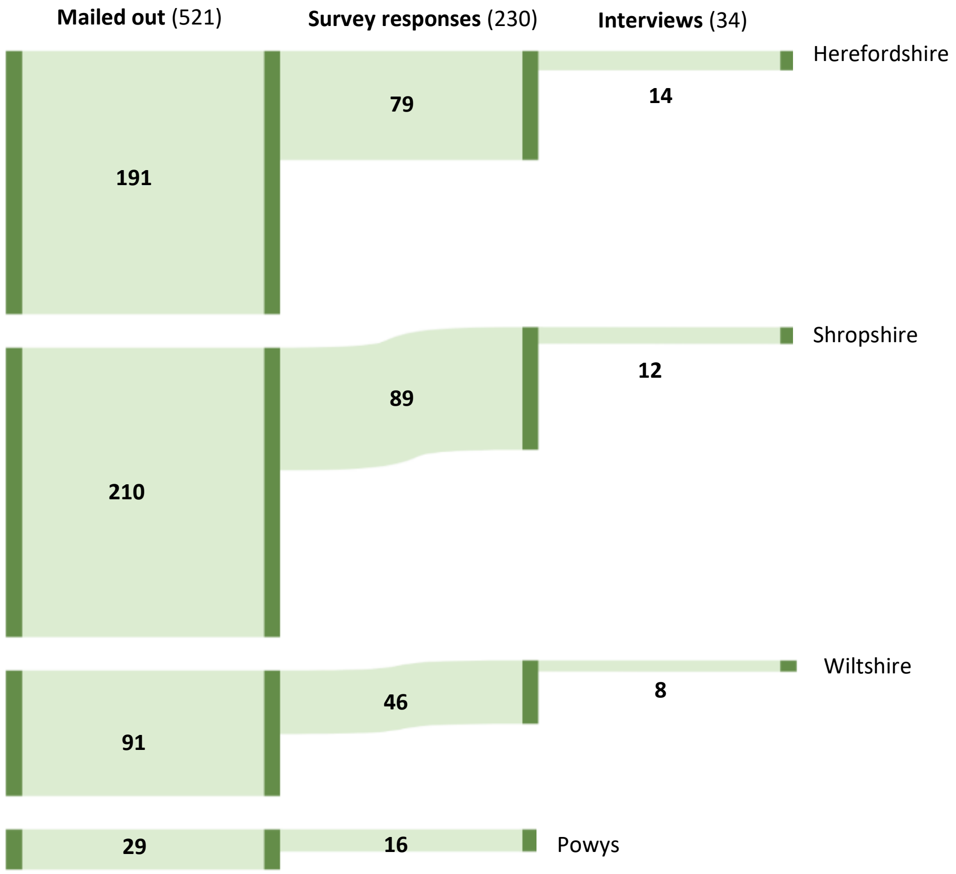

Figure 3.11. Derivation of survey and interview respondents from mail out, by county
Created by author

3.3.5.3 Interview method and challenges

Preparations were made to offer video interviews using software such as Zoom, but the respondents wished to talk on their mobile or landline; many did not have a smartphone and disliked video software. Most of the interviews were conducted in the researcher's car, because of a lack of good telephone signal at home. The conversations were not recorded, mostly for reasons of practicality, but also to save time later in transcription.

There were some disadvantages to holding the interviews on the telephone. Sometimes the interviewer rushed to ask the next question because of wanting to cover so much ground in the 30 minutes available, which is a common mistake made by researchers (Irvine, 2011). Talking by telephone meant it was not possible to see the respondent *in situ* – to get a feel for their farm or their geographical location, which could have put some of their responses in context, such as comments on their remoteness or the set-up of their animal sheds. An advantage of this is that it forced the researcher to rely on what the respondent said rather than the researcher's interpretation of what she saw, which would have involved her own prejudices as well as knowledge (Irvine et al., 2012). Nor was it possible to pick up on facial cues or body language (Lechuga, 2012). Sometimes the researcher said things that did not elicit the expected response, and the respondent's face was not visible to show what was said wrong. It was occasionally difficult to hear exactly what a farmer said, and at least four of them did not give the interview their full attention, as they were doing other things while talking on the phone such as moving sheep or doing paperwork. Similarly, respondent were not able to see this researcher. Respondents in Herefordshire and Shropshire did not always understand the researcher's accent, and some farmers are likely to have thought the researcher younger than she actually is. This could have affected the power dynamics of the interview in the sense of giving the respondent a more paternal/maternal or didactic role – many seemed to want to help the interviewer as a 'young person' and they may have felt more willing to explain things than if they had realised the interviewer was a mature student with professional and research experience. To the researcher this was beneficial, as it gave freedom to ask what felt like stupid questions about the farm system.

Despite or because of these factors, it was quite easy to strike a rapport with the respondents and there did not seem to be an issue with reticence. In some ways, the respondents may have found it easier to speak openly over the phone than face to face (Irvine, 2011). Many of them were very candid about issues with family or staff, although when it came to speaking about farm assurance, while respondents were happy to be critical they did not often disclose specific instances of non-conformance, perhaps because there were things they did not want to share. Telephoning was also preferable from the respondent's perspective, in the sense that it probably required less of their time than a face-to-face meeting would have and the interview could be scheduled early in the morning or late at night if they wished.

A drawback of delaying the interviews because of the Coronavirus pandemic is that around eight months had passed since the respondent filled in the questionnaire and their responses were not fresh in their memory, although they had been sent the preliminary findings in March. Also, it meant that the situation on some farms had changed – for example, one respondent had sold their dairy herd since filling in the questionnaire, another had recruited a permanent worker. However, this proved to be interesting and useful, as it gives insights into how farming systems change over time and the dynamics that affect farm labour systems.

3.3.5.4 Analysis

Though recordings were not made, detailed interview notes with some verbatim sections were transcribed immediately after the interview. To begin the process of critical analysis (Merriam, 2009), any observations were added, such as the following examples:

> "From this and other interviews, starting to see lack of 'fluidity'/responsiveness to demand [elasticity?] in labour market"

> "Signs of impending trigger event, largely caused by TB testing + him getting older"

Also some critical notes concerning the research itself were made. For example:

> "This interview was very bad! He was monosyllabic a lot, didn't really open up, and talked about technical things I didn't understand… I didn't want to linger teasing out his answers because he answered in such a terse 'get it over with' way. He said the interview might help take his mind off his troubles, so maybe he was worried or annoyed about something."

Once all interviews were concluded, the notes were compiled then read repeatedly to start to identify patterns and contradictions. Since the interviews were not recorded, an informal method of descriptive coding (Leavy, 2017) was used to mark up the transcripts according to themes relating to the Research Questions and the topics that had been identified through the questionnaire survey analysis.

The qualitative findings from the interviews were used partly to propose explanation for results from the quantitative survey analysis, and partly to go further and address other aspects of Research Questions. As the primary data began to come together, it was possible to develop observations at a more conceptual level and reflect on how well the data fit the elements of the conceptual framework that underpinned the research design. For the analysis of the farms' resilience, a profile of each respondent's farm labour system and trajectory was drawn up under thematic headings, inspired by the method described by Cialdella et al. (2009) of writing farm-level monographs. Detailed descriptive findings from the interviews are provided to give the study richness and establish its validity (Merriam, 2009).

3.3.6 Stakeholders

A small number of stakeholders were interviewed or consulted after the scoping phase. They include a livestock researcher, an officer from the National Sheep Association, a Natural England adviser, the Technical Manager of Randall Parker Foods and an expert in regenerative grazing, who all helped the researcher to understand trends in policy and practice for the forward-looking policy case studies. Two people were consulted about the methodology of the Farm Business Survey (Cristobal Rengifo Castillo, Statistical Officer at Defra, and Keith Robbins, Senior Research Officer at Duchy College).

3.4 Research ethics

The study design was reviewed and approved by the Ethics Committee of the School of Agriculture, Policy and Development. Measures were put in place to address ethical issues relating mainly to the questionnaire survey and farmer interviews.

In this study, farmers were asked to reveal commercial relationships and to comment on how their buyers' demands affected the farm workload. It was important for the respondents to feel confident that no harm would come to their business by discussing such matters with the researcher. To achieve this, care has been taken to ensure that no respondent or respondent's farm business can be identified by descriptive information in the thesis. This particularly protects respondents who are involved in supply chain relationships or certification schemes that involve only a small number of farms. In this study, there is considerable discussion of the Red Tractor farm assurance scheme, and since this is so ubiquitous, it was deemed safe to specify both the scheme and farmers' attitudes towards it.

The study involves discussing farming practices in detail, including practices which are claimed by advisers or activists as more ethical or environmentally sustainable than others. Care was taken to avoid passing judgement on study respondents. The study is normative in the sense that it aims to support English farming, animal welfare and environmental sustainability, but the study does not explicitly advocate any particular farming system or business model.

There were two cases where the respondents, both women, reported unfairness within the workforce, where they had less favourable terms of employment and were expected to do less enjoyable tasks than other (male) members of the workforce. Since the interviews were conducted over the telephone and the findings were not shared with anyone else at the farm, there is very low risk that participating in the study put the two respondents in a difficult position or inflamed tensions within the workforce.

Each farm in the farm list was assigned a unique respondent number. This number was written on the paper questionnaire when it was mailed out, so that it was not possible to identify the farm. When the questionnaire was posted, it included a covering letter which explained the purpose of the study, provided assurances of how the information would be managed, and explained that confidentiality and anonymity would be protected. At the beginning of each interview, the respondent was again informed that their details would remain confidential and anonymous, and asked if they were happy with that. Another participant information sheet was posted to the respondent after the interview, which gave a fuller explanation of how their confidentiality and anonymity would be ensured and provided the researcher's contact details.

4. Conceptual framework

The conceptual framework for this study is formed from the strands of political economy, theories of labour flexibility and ideas and concepts from resilience studies that were discussed in Chapter 2. It was also influenced by discussions and observations during the scoping stage and by the researcher's own worldview (Agee, 2009). The framework brings together – *a priori* and deductively – the researcher's theoretical assumptions about the study topic and serves as a lens through which the results are interpreted. This chapter explains the thinking behind the conceptual framework and summarises it in a model (see Figure 4.2) and a set of hypotheses, elaborated from the research questions, that the study aims to test during the process of answering the Research Questions:

- Hypothesis 1: External requirements are adding to workloads and changing the nature of livestock farming, which farmers may feel powerless to refuse and which might also be discursively concealed or legitimised through the narrative that livestock farmers are hard-working and always find a way to 'get things done'.
- Hypothesis 2: Farm businesses can absorb the changing demands for labour-time to some extent because each farm labour system has some degree of elasticity.
- Hypothesis 3: The additional work involved in complying with external requirements or pursuing alternative routes to market can stretch the adaptive limits of some farm labour systems by exceeding the capacity of the workforce and/or changing the nature of the workload, at which point a threshold is reached and something changes.

4.1 Hypothesis 1

The conceptual framework for this study begins with the observation from the literature that many farm businesses are facing requirements on their time in the form of regulation, buyer requirements and farm assurance schemes that they choose or feel compelled to participate in. Such schemes are designed, at least in part, to achieve benefits for society such as food safety, environmental sustainability and animal welfare. This study takes a farmer-centric perspective on such schemes. Rather than emphasise the wider social goals, the study focuses on the potential benefits for the farms themselves and, notably, the potential costs.

By drawing on concepts from Global Production Network approaches, political economy and critical management theory (e.g. Pimbert et al., 2001; Coe et al., 2008; Spence & Bourlakis, 2009; Bowman, 2013; Brooks et al., 2017), this study frames requirement schemes as a potentially exploitative mechanism by which governments and market actors pass on to farmers the costs of governance and surveillance and exert control over supply. Even when they enter a private-sector scheme voluntarily, many farmers must comply with the requirements of external bodies from a weak position, given the unfavourable farmgate prices and contracts on offer to them and the dominance of supermarkets in meat and dairy supply chains.

One paper that informed the development of this hypothesis was a study published by Brooks et al. (2017) on power and trust in agri-food supply chains, which used beef farming in Northern Ireland as a case study. Brooks et al. identified oligopsony and information asymmetries that benefited beef processors over farmers. The authors observed that the farmers had internalised their unfavourable position in the supply chain to some extent:

> "There was a sense [in interviews] that farmers were 'filling in' missing information or 'joining the dots', particularly when they were unable to articulate the specifics of how processors, for example, use their lobby power. This points to the idea… that perceptions of powerlessness may in certain circumstances be self-reinforcing if they begin to structure action and response amongst weaker parties. If you believe your buyers to be all powerful and you perceive yourself to be powerless, this will have an impact on negotiation and bargaining strategy" (ibid., p.122).

During the scoping phase of the present study, several stakeholders including academics suggested that the potential workload of external requirement schemes was not a particularly interesting or relevant topic for research, since – in their opinion – farmers simply found a way to get the work done; that was just the nature of farming. Perhaps schemes do not add significant work, or perhaps farmers do not comply with the demands. That is for this study to question. But the stakeholders' comments, in addition to the findings of Brooks et al., raise another possibility, which is that the imposition of extra work is being discursively concealed or legitimised by a narrative that livestock farmers are stoic, hard-working and always find a way to get things done. It has been demonstrated by political ecologists and other researchers influenced by political economy and discourse theory that powerful market and policy actors sometimes exploit or construct narratives, and frame events, to legitimise their positions of power (Robbins, 2004, chapter 6; Adger et al., 2001; Leach & Tadros, 2014). In this case, a discourse of stoicism and acceptance in English livestock farming might be not only endorsed by external actors but to some extent internalised by the farmers themselves.

The first hypothesis of this study, therefore, is that **livestock farmers accept additions to their workload because they feel powerless to refuse and because they identify with a culture of working long hours and 'doing what it takes'**. If so, this could be exploited by industry regulators and supply chain actors, since it is well established that farmers are often unwaged (as shown in section 2.3.2) and therefore might not be compensated directly if their working hours increased. It is also possible that additional work is being accepted by male farmers because many of the requirements are for paperwork, which is traditionally done by female members of the farming family (Gasson & Winter, 1992; Kirwan, 2010) and who may have a less powerful position and voice within the household (Sifaki, 2014; Alston et al., 2017).

4.2 Hypothesis 2

In practice, the literature review shows that many farmers, together with their spouses, other household members, workers and contractors, must be complying with additional requirements for paperwork and for certain farming practices owing to regulation, buyer demands and assurance schemes. Some farms find time to invest in opportunities such as alternative routes to market or enterprise diversification. And, as argued above, even if they are not burdened by external requirements or new business development, many farmers are needs-must managing their enterprises with a workforce that is constrained by poor financial returns (which affects farms' ability to afford paid labour and/or forces members of the farm household to seek off-farmwork), an ageing workforce and, in some situations, difficulties in recruiting labour.

A central question for this study is, how are farmers and their workforces meeting these changing demands on their time? The conceptual framework draws on the theories of labour flexibility and resilience to hypothesise that farmers are able to absorb changing demands for labour-time because **each farm labour system has some degree of elasticity**.

This idea was first encountered during an early scoping discussion with a farm manager. He explained that he was able to carry out labour-intensive activities for an AES because he had "flex" in his labour system. At busy times of the year, he and his contractors would work long overtime to get the work done (interview, Oxfordshire farm manager, 23 October 2018). The concepts of functional and numerical flexibility popularised by Errington, Gasson and others provide an abstract way to explain the farm manager's strategy. The amount of surplus or under-employed labour in the farm's workforce could be critical, as could the level of diversification or specialisation. Going further, the concept of work organisation from Hostiou and Berdieu broadens this to flexibility in the overall farming system, and allows us to incorporate into the hypothesis that farmers may be able to respond to external demands on their time by making changes to their livestock production systems.

Such flexibility could be conceptualised as a type of resilience where a system can absorb or buffer disturbances (Walker et al., 2004); "bounce without breaking" as Shadbolt et al. phrase it (2017:1138). Flexibility is sometimes discussed in resilience studies as *room for manoeuvre* (Milestad et al., 2012). In her analysis of the labour systems of French organic sheep farms, Hostiou (2013) identified the importance of room for manoeuvre in enabling the farms to increase their labour-input and productivity when needed and to modify their volume of work according to the peaky demands of their production systems (see also Hostiou & Dedieu, 2011). Conceptually, the idea of a system such as a farm workforce stretching as an adaptive response also has parallels with the concept of latitude proposed by Walker et al. (ibid.). In their conceptual framework of socio-ecological systems, Walker et al. use the term latitude to describe how much a system can change after a disturbance without losing its ability to recover without being irrevocably altered.

4.3 Hypothesis 3

If we accept that each farm labour system has some degree of elasticity, it leads to another question: is there a point at which the system can no longer stretch? According to hypothesis 2, we would expect farmers to use adaptive strategies when faced with changes to their workforces and workloads. However, the actual changes experienced and the farm's capacity to adapt to them will vary (Dedieu, 2009). Perhaps on some farms whose labour systems have become stretched, a threshold or breaking point is reached.

New thinking in resilience studies holds that making major changes to a system in response to disturbance is still a form of resilience, even though the result is more transformation than persistence. This describes the capacity to create a new system when the current situation becomes untenable (Walker et al., 2004). It is sometimes termed 'bouncing forward', as opposed to 'bouncing bank' (Kuhmonen, 2020). Darnhofer (2021:2) argues that studies of farm resilience should shift the emphasis on resilience as "the ability to cope with an external shock" to "the ability to transform".

Researchers have observed that when a system undergoes a shock, it can open up new opportunities and ultimately lead to a positive change in direction (Milestad et al., 2012; Gosnell et al., 2019; Darnhofer, 2021). Indeed, some studies imply that farms which undergo occasional transformative change are more resilient than farms which continue with unchanging systems year after year. The latter farms are sometimes depicted as stuck on a sub-optimal path, their transformative capacity inhibited by external factors or by the personal characteristics of their principal farmers, be they older, less well educated or more risk-averse (Bowler et al., 1996; Wilson, 2008; Winter & Lobley, 2016; Morris et al., 2017a; Munoz-Ulecia et al., 2021).

Labour issues as a driver of change

Researchers studying farm resilience, farmer decision-making and farm-level transitions have documented the events and pressures that prompt major changes in farming systems such as specialisation, organic conversion and so on. Of 26 such studies reviewed,[7] 15 listed labour issues among the drivers of change (Edwards, 1980; Bowler et al., 1996; Lobley & Potter, 2004; Wilson, 2008; Cialdella et al., 2009; Rueff et al., 2012; Sutherland et al., 2012; Lobley et al., 2013; Madelrieux et al., 2015; Winter & Lobley, 2016; Morris et al., 2017a; Padel et al., 2018; Darnhofer, 2021; Hayden et al., 2021; Muñoz-Ulecia et al., 2021). The most common labour-related drivers of transformative change were: scarcity or unaffordability of labour; farmers seeking retirement or a better work–life balance; and aspects of family farm succession, particularly the desire to create employment for a family member, a returning family member wishing to take the farm business in a new direction or, conversely, not having family members available to take over the business. Three studies specified that excessive workloads prompted farmers to make a major change.

Overall, labour issues are not typically highlighted by transition researchers as the strongest drivers of adaptation or transformational change at farm level. Those tend to be external drivers such as policy reforms and commodity price changes, or internal drivers such as financial problems or a farmer's aspirations. While there has been much discussion on the flexibility of farm workforces, there has been less discussion on the specific capacity of farm labour forces to stretch as a coping or adaptive strategy. Furthermore, very few studies report that farm labour systems can be stretched to the point of breaking and that this leads to change in the trajectory of a farm business.

Perhaps this is because hypothesis 2 holds true, and farm labour systems can cope with challenges just by stretching. Or it may be that labour and workload issues are not significant enough to trigger change on most farms. But there does seem to be a lack of detailed, probing studies to uncover the role of labour dynamics in farm resilience and change. This reflects a lack of political economy and classical economics in the farm system research reviewed here. Labour, placed centre stage by Marx, Chayanov and Kautsky, has been displaced by a concern with values, attitudes, perceptions and management, influenced by disciplines such as social psychology, ecology and management science (Wilson, 2008; Willock et al., 1999; Rose et al., 2018). As Gosnell et al. (2019) describe it, there has been a move from the practical and political spheres to the personal sphere in research on adaptation (see also Darnhofer et al., 2012, on the evolution of research on farmer behaviour and decision-making). This seems to be an especially strong trend in the UK. In mainland Europe, there are more studies on farm development and change that refer to workloads, labour and productive resources in general (e.g. Cialdella et al., 2009; Hostiou &

[7] Studies were identified using Scopus using the search terms 'change+farm+system+AND NOT+climate+change' and 'drivers+change+farm', with a preference for studies that included livestock farms in the UK or western Europe. Studies on alternative food networks (see Chapter 2.1.3) were also reviewed for any mention of the factors that prompted farmers to change their marketing channel.

Dedieu 2011; Milestad et al., 2012; Huber et al., 2015), particularly concerning the apparent link between labour scarcity, farmer ageing and farmland abandonment in uplands (MacDonald et al., 2010; Rueff et al., 2012; Madelrieux et al., 2015).

There is even less discussion in the literature on the possible role that the workload from external requirements could play in triggering change. This was mentioned indirectly in only seven of the 25 reviewed studies. Examples include buyer requirements on animal welfare guiding pig farming practices in the Netherlands (Elzen et al., 2011). Why are external requirements rarely identified as drivers of change? It might be because studies of farm transitions and resilience have focused on shifts to more environmentally sustainable practices or more multi-functional, diversified businesses (Darnhofer, 2012; Gosnell et al., 2019) rather than on statutory requirements, commercial relations and routes to market. In their analysis of the reasons why Irish farmers expand farm businesses, Hayden et al. (2021) suggest another reason. They discern that external requirements from the private sector do not factor into decision-making because they are difficult for farmers to escape, even through transformational change:

> "The discussions with farmers around the strategic farm expansion decisions undertaken do not provide any meaningful insight into how the financial aspects of supply chains, contracts and market conditions influence such decisions… When farmers discuss the issues that influence their strategic farm expansion decisions, they do not necessarily think about uncontrollable factors such as supply chains, contracts and market conditions, as farmers are price-takers with supply chains and contracts [are] mainly non-negotiable" (ibid.)

Studying pathways of change on English family farms in the early 2000s, Lobley and Potter (2004) distinguished between the farm business and the farm household. They posit that farm businesses are less adaptable than farm households and may undergo less dramatic change, since they have become "subsumed" into supply chains. The implication is that farms' marginal position in the agri-food regime restricts their transform-ability, which links back to hypothesis 1.

An aim of the present study is to investigate further if and how labour issues and external requirements can be a driver for change. The third hypothesis is that **the additional work involved in complying with external requirements or exploring alternatives could stretch the adaptive limits of the farm labour system by exceeding the capacity of the workforce and/or changing the nature of the workload, and force a change to occur.** The kind of changes that we might expect to see include a reconfiguration of the *workload*, perhaps by opting out of a scheme or significantly adjusting the labour intensity of a livestock enterprise; or a reconfiguration of the *workforce*, such as employing additional labour.

Breaking point

The literature on farm resilience and development pathways provides some conceptual models for understanding how a stretched farm labour system might reach a breaking point and prompt a change (Figure 4.1). One such is the triggering change model developed by Sutherland et al. (2012). The authors observed that farm businesses can become locked into a certain way of doing things. In the Sutherland et al. model, farms that are in this state of path dependency make only minor changes to the farming system, which are made incrementally. The authors argue that something dramatic is often necessary to jolt a farm business out of its trajectory, such as a livestock disease outbreak, major policy reform, farm succession or the death of a member of the workforce. Pressure builds until the principal farmer recognises “that a major change in farming activities needs to occur” (ibid., p.146). This point of recognition is the trigger event, which is followed by a lengthy period while the farmer assesses their options and puts a plan into effect. Conceptualising farm transitions using the example of farms switching to regenerative agriculture, Gosnell et al. (2019:6) propose a similar idea that a change in direction may occur at “moments of change or crisis”, when farm decision-makers are forced to reassess their systems.

The Sutherland et al. model would fit a hypothesis that farm labour systems adapt by stretching until they reach breaking point and a major change to the workload or workforce must be made. What would the ‘breaking point’ look like? It would be the moment at which the principal farmer decided that the current situation was no longer manageable. The way that Sutherland et al. (2012) define a major change in a farm business is that it involves a dramatic change in the use of resources, the farm decision-maker makes a conscious decision to redirect the business and the decision is prompted by one or more significant events that the farmer experiences or anticipates. Minor changes are made with less conscious or momentous decision-making and without necessarily having been preceded by a significant trigger.

Darnhofer (2021) proposes a model of farm transition where the distinction between minor and major changes is less important and recognisable only in hindsight. She argues that a minor change can lead to transformation too. Like Sutherland et al., Darnhofer observed that farmers may experience pivotal moments or turning points in the evolution of their farm businesses, but she emphasises that change is a constant process, with less planning and more “ongoing tweaking and fine-tuning” (ibid., p.11). In Darnhofer’s flow of change model, we can imagine that labour issues and external requirements could place the labour system under strain, but the breaking point might not be consciously recognised by the farm decision-maker, and it could be that smaller adjustments made along the way – not necessarily by the principal farmer or farm manager but perhaps by other members of the workforce – unexpectedly lead to significant changes in the farm business.

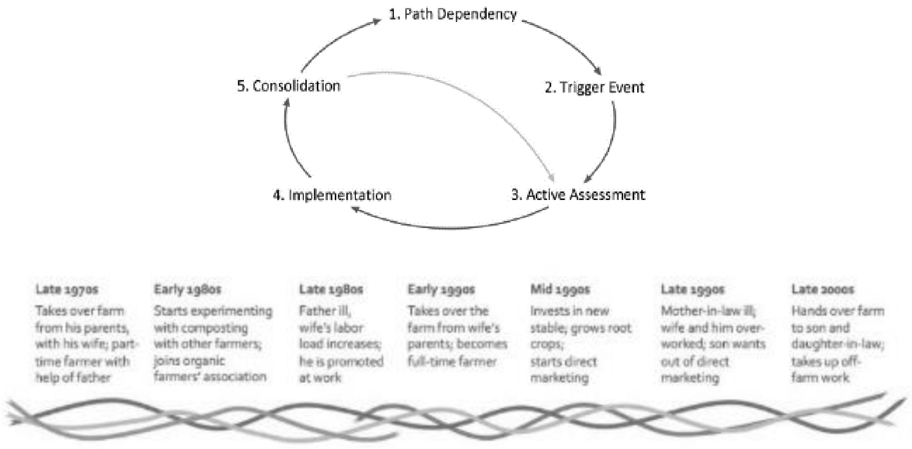

Figure 4.1. Sutherland et al.'s triggering change cycle (top) and Darnhofer's flow of change (bottom) Sources: Sutherland et al., 2012:144 and Darnhofer, 2021:12

This study uses these ideas to assess how external requirements and other potential pressures on farm workforces might contribute to farm-level change. Whereas studies of farm transition and resilience often concentrate on a certain *outcome*, such as organic conversion, expansion, change in marketing channel or land abandonment, this study will concentrate on a certain type of *driver*, that is, labour-related drivers. The study asks if such models are even appropriate for this subject.

At a basic level, the concept of labour pressure leading to change could be compared to economic theories of labour allocation (Doyle, 1990; Donnellan & Hennessy, 2012) or a rational utility maximisation or cost–benefit model, articulated by Bartolini et al. (2020) in relation to farmers' participation in AES as simply: "In general, a farmer will opt out of an [agri-environment] measure when the (expected) costs are higher than the (expected) benefits." But the work of Sutherland et al. and Darnhofer is particularly useful for this project because it fits with concepts of workforce flexibility and resilience, it highlights the constraints that might prevent a farm from escaping an excessive workload, and it allows for testing the idea of a sense of build-up or stretch in the farm labour system before a major change is made.

Figure 4.2 presents a model for the squeeze on labour that livestock farmers may be experiencing and the way in which this could trigger change.

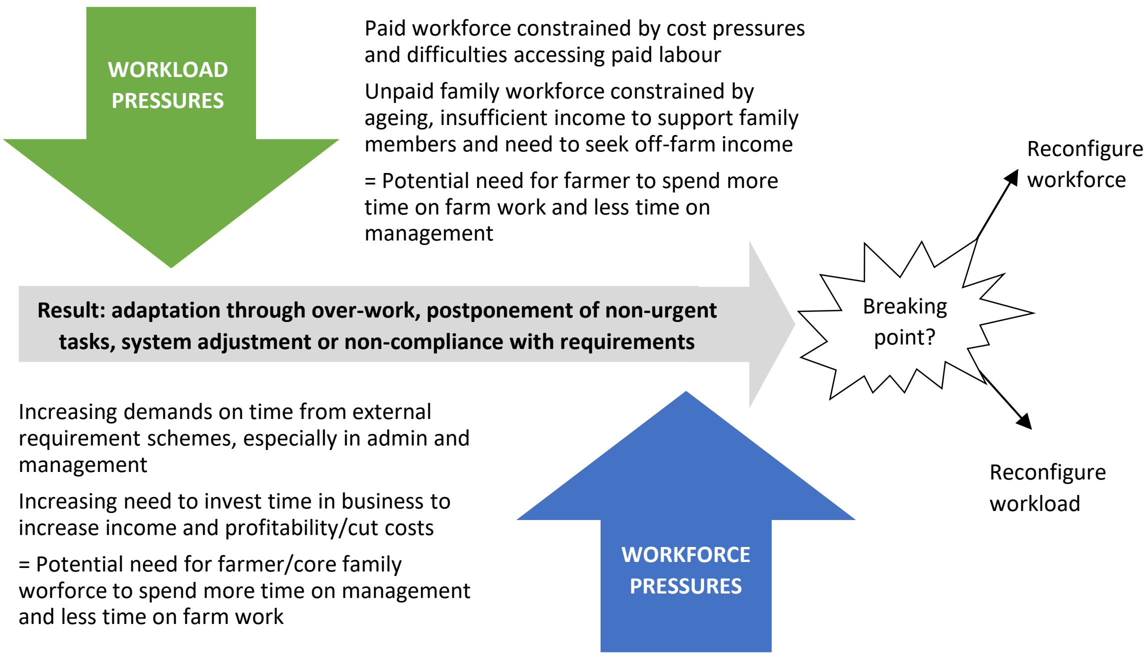

Figure 4.2. Model of external requirements adding to a labour squeeze and a potential breaking point in labour systems of livestock farms
Created by author

5. Exploring requirement schemes

With the background and conceptual framework for the study established, the thesis now moves on to present results from the execution phase of the project. We begin in the next two chapters with the analysis of secondary data. This chapter presents analysis of some of the key external requirement schemes that UK livestock farmers may be participating in. The chapter compares what the schemes cover and what kind of activities they require. The purpose of the exercise is to better understand what schemes involve, in order to help assess how they might be affecting farm workloads, as per Research Question 2, and how their recent development may have contributed to a change in the nature of livestock farming over time, as per Research Question 1. A full description of how the analysis was undertaken is provided in Chapter 3.3.1.

5.1 The compliance landscape

Farms do not only operate in a physical landscape. Farms also operate in an invisible regulatory landscape of laws, buyer demands and voluntary initiatives. These all introduce external requirements on how the land is farmed and the business is run.

Figure 5.1 maps out the main external requirements that the English and Welsh livestock farmers in this study may face, or choose to adhere to.

Among the multiple demands facing farmers, Figure 5.1 highlights *requirement schemes*. A requirement scheme is understood to be a set of rules concerned with food safety and traceability, environmental sustainability, animal health and welfare, and/or another sustainability and ethical issue. The rules of a scheme, which are known collectively as standards, are developed by an external entity for farms to comply with, and the farms' compliance against them is verified externally in some way. This provides market assurance, hence the label 'farm assurance' being used for private-sector schemes. When it is a certification scheme, the farm and their livestock or produce are certified against the standards by an independent certification body, which is separate from the standards body. None of the requirement schemes in Figure 5.1 is strictly mandatory, although Cross Compliance contains statutory laws that must be adhered to and, as demonstrated in Chapter 2.2.1, participation in some private-sector schemes is compulsory if the farm wishes to enter certain markets.

5.1.1.1 The statutory foundation

Legislation lays out the fundamental farming practices and paperwork and administration tasks that livestock farmers in England, Wales or all of the UK must comply with as a baseline, even if they do not participate in any public- or private-sector requirement schemes.

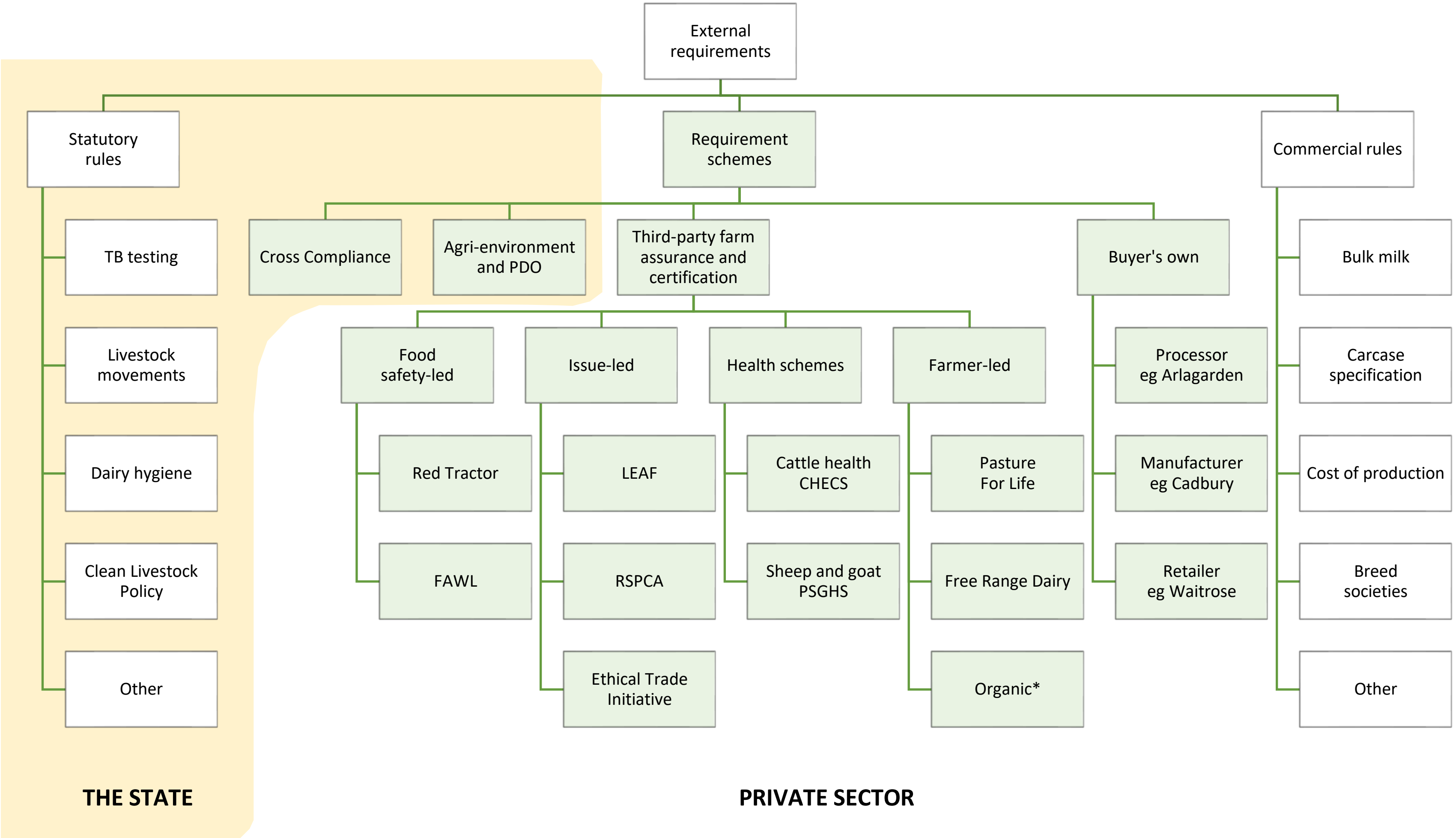

Figure 5.1. External requirements facing livestock farmers in England
Created by author. Yellow shading covers state (as opposed to private-sector) requirements. Green boxes indicate *requirement schemes* as defined in this thesis.*Organic certification is also supported by the state through a special organic agri-environment scheme.

Livestock movements

By law, cattle farmers in England must apply for identification documents called cattle passports for new calves, fit two ear tags to each animal, and keep a record in a holding register of all cattle breeds, births, deaths and movements. They must inform the British Cattle Movement Service when moving cattle on or off the holding, and when they sell cattle, farmers must update the cattle passport and pass it on to the new owner (GOV.UK, 2020a). The requirements for sheep are lighter as sheep passports are not required. However, sheep farmers in England must record births, deaths and movements in a holding register, as well as total sheep numbers in an annual inventory. Sheep must have two ear tags or identifiers, one of which must be an electronic EID tag, and movements off or on to the holding must be reported (Defra, 2014).

Holding registers can be electronic or paper-based, and farmers can use online systems or commercial farm software to report animal movements. While EID identifiers have been required for sheep since 2014, there are proposals in England for EID tags to become compulsory for cattle and for cattle passports to be replaced with data recorded on the EID chip (AHDB, 2020a).

Medical records

Farmers' legal duty of care for their animals is laid out in the 2006 Animal Welfare Act and 2007 Welfare of Farmed Animals (England) Regulations. Under the 2007 Regulations, farmers must keep a record of livestock deaths and veterinary medicine treatments. The 2013 Veterinary Medicines Regulations also require farmers to keep a record of medicine purchases and disposal for five years.

TB testing

Statutory rules for cattle to be routinely tested for bovine TB have been in place since 2015. By law, cattle keepers in England must have every animal in their herds tested every six months in certain high-risk or 'edge' areas (including Shropshire since September 2020), every 12 months in other high-risk and edge areas (including Herefordshire and Wiltshire) or every four years in low-risk areas. Wales has its own approach: farms in Powys must undergo annual surveillance testing and also conduct tests before moving cattle. If a positive 'reactor' test occurs, if two consecutive inconclusive results are recorded or if a slaughterhouse finds TB lesions on one of the farm's cattle, the herd is said to have a TB breakdown (GOV.UK, 2020b). Infected animals must be slaughtered (for which financial compensation is paid), animals with inconclusive results must be isolated, any milk from affected dairy cows must be excluded from sale, the farm must be disinfected and no cattle can be moved from the site without a licence. Subsequent TB tests must then be carried out before restrictions can be lifted and the herd can be designated officially TB free. In certain cases, herds must pass two consecutive tests 60 days apart before restrictions are lifted, and farms can become trapped in a cycle of testing and inclusive results (e.g. Case, 2018).

Other regulations

Farm businesses face a host of further regulations on a range of subjects. They include health and safety legislation to protect farmers and workers; and statutory rules on the welfare of sheep and cattle to prevent suffering at slaughter and during transport. There are laws on waste management, fallen stock (dead livestock) and food safety, including control over Maximum Residue Levels in produce. Under the Farming Rules for Water, farmers must take steps to avoid soil erosion and contamination of watercourses by inputs. There are especially strict rules for farms in Nitrate Vulnerable Zones, which are areas that drain into waters at risk from nitrate pollution (Environment Agency, 2016). Further laws cover land matters such as land registration and agricultural tenancies.

Dairy farms in England and Wales must register with the FSA and comply with hygiene standards. Farmers test milk for antibiotic residues and keep test records. They must maintain clean premises, animals and storage facilities to prevent contamination of milk.

5.1.1.2 Cross Compliance

Many of the statutory requirements discussed above are covered by Cross Compliance (GOV.UK, 2019c). In England, Cross Compliance comprises a set of 24 rules which are divided into statutory management requirements (SMRs) and standards of good agricultural and environmental condition (GAECs). Farmers must follow Cross Compliance to qualify for the BPS, on condition of possible inspection by an authority. This compliance framework is being changed following the UK's exit from the European Union in 2020.

5.1.1.3 Agri-environment schemes

There can be national, regional and sector-specific AES, which are voluntary. The current national AES in England and Wales are Countryside Stewardship and Glastir, respectively. Farmers and land-owners enter into an agreement with Defra to manage their land in a certain way in return for financial compensation. As with BPS, AES are being changed after Brexit, with plans for a new ELM agri-environmental framework.

5.1.1.4 Third-party certification schemes

The dominant third-party farm assurance schemes for livestock farming are the Red Tractor schemes such as Red Tractor Dairy, Red Tractor Beef and Lamb and the Welsh equivalent, Farm Assured Welsh Livestock or FAWL (farms have separate Red Tractor membership for each enterprise). Most UK livestock farmers have Red Tractor certification. In 2015, Red Tractor

Assurance had 11,435 dairy members, representing 95% of milk produced in Britain, and 24,090 beef and lamb members, representing 82% of all finished cattle but only 65% of finished sheep (Red Tractor Assurance, 2016).

Most animals sold at livestock auction are so-called farm assured, which the industry uses to refer to Red Tractor or FAWL (Table 5.1). Red Tractor is also prevalent in vertical supply chains. Milk buyers and processors such as Arla and Mueller require all of their dairy farmer suppliers to be Red Tractor assured. Randall Parker Foods, one of the UK's largest beef and sheep processors, supplies major retailers who all request farm assured produce (personal communication, Senior Technical Manager, 19 October 2020). The beef processor group ABP, which has two abattoirs in Shropshire, requires livestock to be Red Tractor assured, and for the haulage to comply with Red Tractor transportation rules (ABP Livestock, 2018). Shropshire-based sheep meat processor Euro Quality Lambs also processes only Red Tractor-certified sheep (Euro Quality, 2020).

Table 5.1. Percentage of livestock sold as farm assured at auction in 2019
Data source: AHDB (2020b)

	Midlands	South West	England
Total cattle (steers, heifers and young bulls)	85%	86%	83%
New season lambs	72%	59%	72%
Old season lambs	72%	56%	72%
Cull ewes	62%	66%	63%

Other third-party schemes among the 10 selected for analysis include Pasture For Life and the Soil Association's organic standards. Pasture for Life is a specialist scheme targeted at certifying production systems which rely on pasture-based diets for their livestock. Organic standards also promote pasture-based systems but are primarily concerned with low-input production as a whole. The Soil Association scheme, and other accredited organic schemes in the UK, are private-sector assurance schemes but also linked to government support. England offers farmers payments for organic conversion and maintenance, which at the time of writing are paid through a Mid Tier stewardship agreement. The state support is additional to any market premium that farmers may receive from selling organic produce.

5.1.1.5 Buyer schemes

The buyer schemes category includes sets of standards that buyers develop independently for their suppliers. Some of the larger food and grain processors have schemes. An example is Arlagarden, a set of mandatory standards that the milk cooperative Arla introduced for its dairy farmers in 2015.

Another form of buyer requirements are the unpublished sets of requirements that UK supermarkets ask of their direct suppliers – that is, the farmers who provide meat and milk for the supermarkets' own-brand products through direct contracts or aligned dairy contracts. Examples include the Tesco Welfare Approved livestock requirements or Waitrose & Partners Select Farm Standards (Tesco, 2020; Waitrose, 2020). Participating farmers are often organised into producer groups and have the expectations written into their supplier contracts. The extent of vertical integration for own-brand products is quite substantial – Sainsbury's, for example, states that it only sources meat and milk through direct contracts (Sainsbury's, 2020). As part of their vertically integrated supply chains, supermarkets may operate their own abattoirs or hauliers, as Morrisons does, or source from a single processor, as Waitrose does with the beef processor Dovecote Park for its own-brand beef.

5.1.1.6 Livestock health schemes

Health schemes are used to give livestock herds or flocks accredited 'high health' status, which may be valued or required by breed societies or buyers. A number of cattle health schemes are regulated by Cattle Health Certification Standards (CHECS), which provides standards for disease control that the schemes must include (CHECS, 2019a). SRUC Veterinary Services has developed a Premium Sheep and Health Goat Scheme for the UK and Ireland. These schemes cover serious diseases which are not notifiable diseases controlled by the state, as TB is, including Johne's disease, scrapie and bovine viral diarrhoea (BVD).

5.2 What do requirement schemes ask farmers to do?

This section presents an in-depth review of what requirement schemes involve, starting with 10 published requirement schemes and followed by the unpublished requirements of seven supermarkets.

5.2.1 Published requirement schemes

5.2.1.1 Number of requirements

Detail on the 10 published schemes selected for analysis is provided in section 3.3.1. Each scheme's rules were broken down into constituent *requirements*. The highest number of distinctive requirements (237) was observed in the Soil Association's wide-ranging organic standard. The smallest number (24) was observed in the Arlagarden scheme, which has a narrower focus on dairy practices. Four of the schemes included requirements that are recommended but not compulsory for overall compliance (Figure 5.2). For the analysis, all requirements, including recommendations, were included.

Particularly with the larger schemes, not every requirement is necessarily applicable to each farm business. In Red Tractor there are rules for sheep which would not apply if the farm only had cattle, and vice versa. As another example, the Soil Association scheme includes some requirements for organic conversion which would not apply to a farm enterprise that had already reached organic status. Also, some of the requirements might be passed to a contractor, such as the LEAF Marque requirement for crop sprayers to be calibrated monthly. Therefore some of the schemes appear more burdensome in this analysis than would actually be experienced by the typical farm.

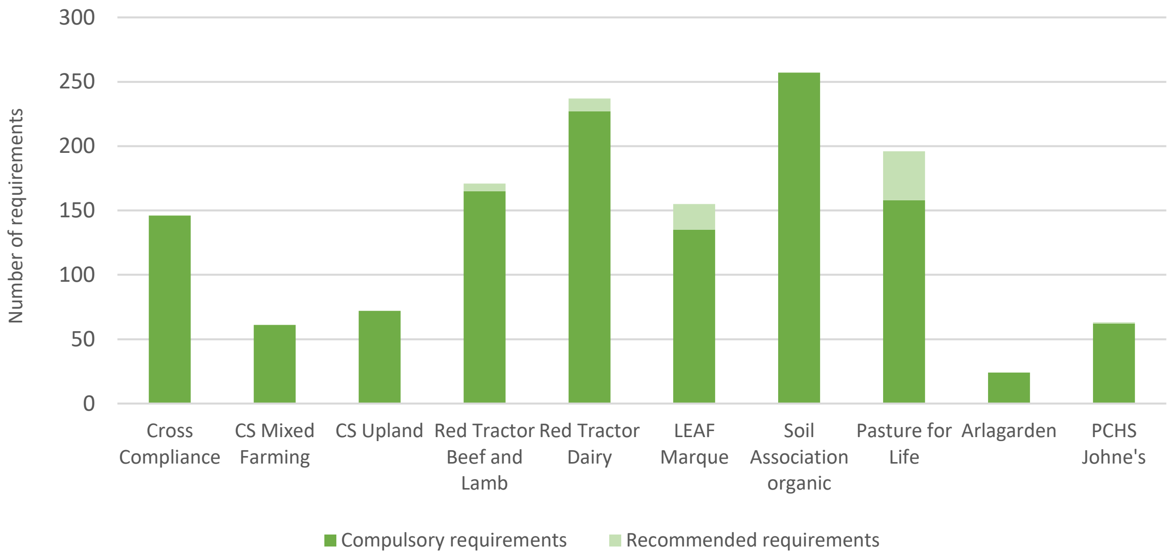

Figure 5.2. Number of requirements per scheme, including compulsory and recommended requirements Compiled by author

CS = Countryside Stewardship

5.2.1.2 Thematic coverage

The balance of the aspects of sustainability covered by the standards varies from scheme to scheme, reflecting its priorities. Figure 5.3 shows that Countryside Stewardship and LEAF Marque are focused on environmental sustainability, with most of their requirements being concerned with either biodiversity, wildlife and conservation, or inputs, nutrient pollution and water protection. In contrast, the Red Tractor schemes address many more themes (environmental and non-environmental). In particular, they devote more than half of their requirements to animal welfare, health and disease control.

The Soil Association organic standard, and to a lesser extent Pasture For Life, include a large number of requirements under the theme of 'scheme control measures and general compliance'; in total, 35% of its requirements related to input sourcing, sales and the farm's management and control systems. These involve things that farms must do to maintain the integrity of certified produce, such as segregating uncertified livestock or sourcing only permissible inputs. Such requirements need farmers to spend time on administration and management systems.

Specific requirements on soil management are still rare, and there are almost no requirements on measuring and reducing carbon or greenhouse gas emissions. In 2019, Arla announced that its members would be required to estimate their farm's carbon footprint (Arla Foods, 2019), but this is not included as a requirement in the 2017 Arlagarden standards reviewed here. It is also very rare for a scheme to set requirements on workers' rights, such as health and safety for those who work on the farm.

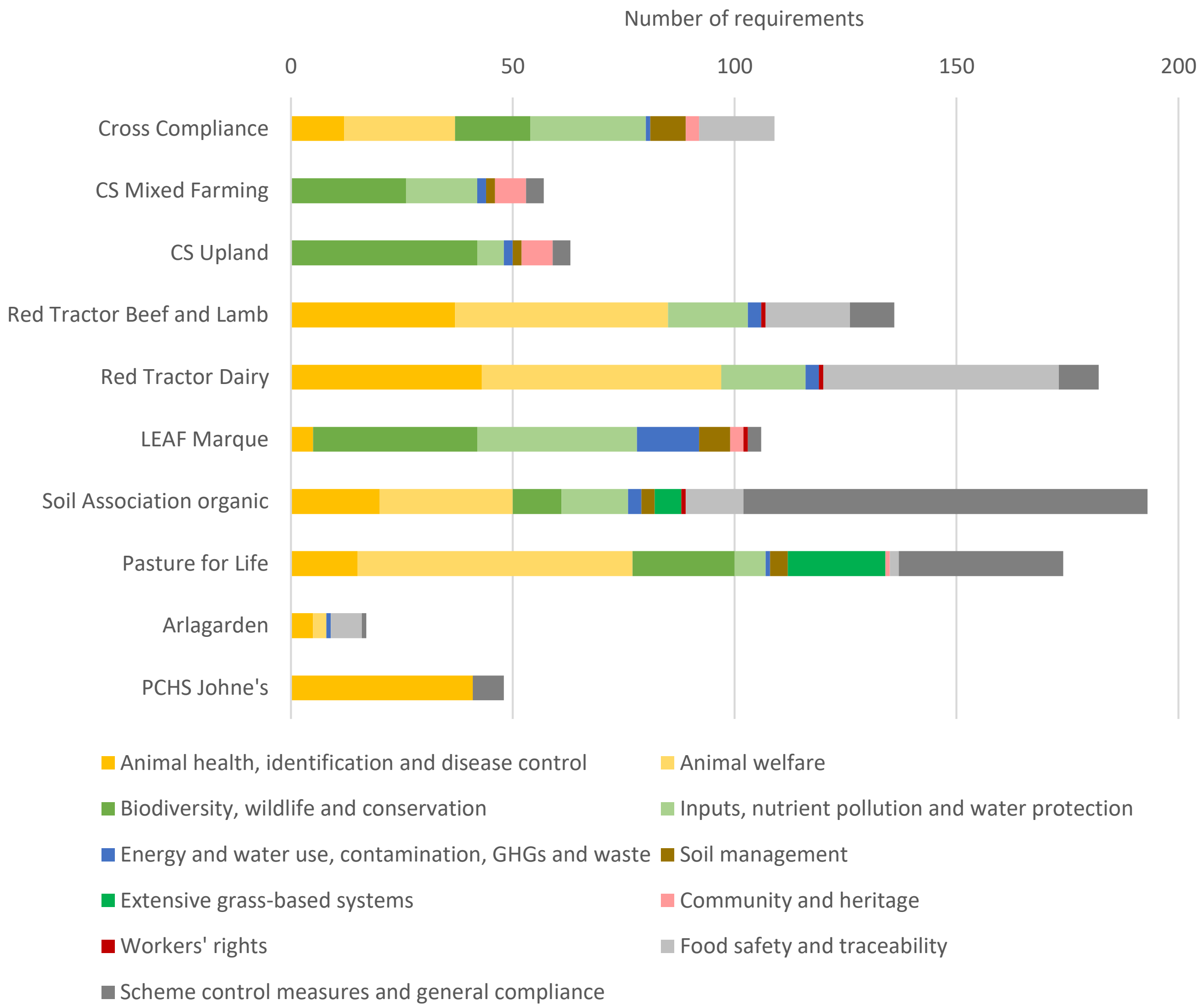

Figure 5.3. Topics of requirements in each scheme
Compiled by author

CS = Countryside Stewardship

5.2.1.3 Type of activity

Each requirement was classified as to the type of activity that it involves for the farmer. A single requirement might involve more than one kind of activity. For example, a requirement concerning medication might involve both animal work and engagement with an expert (i.e. consulting a vet). The results are shown in Figure 5.4.

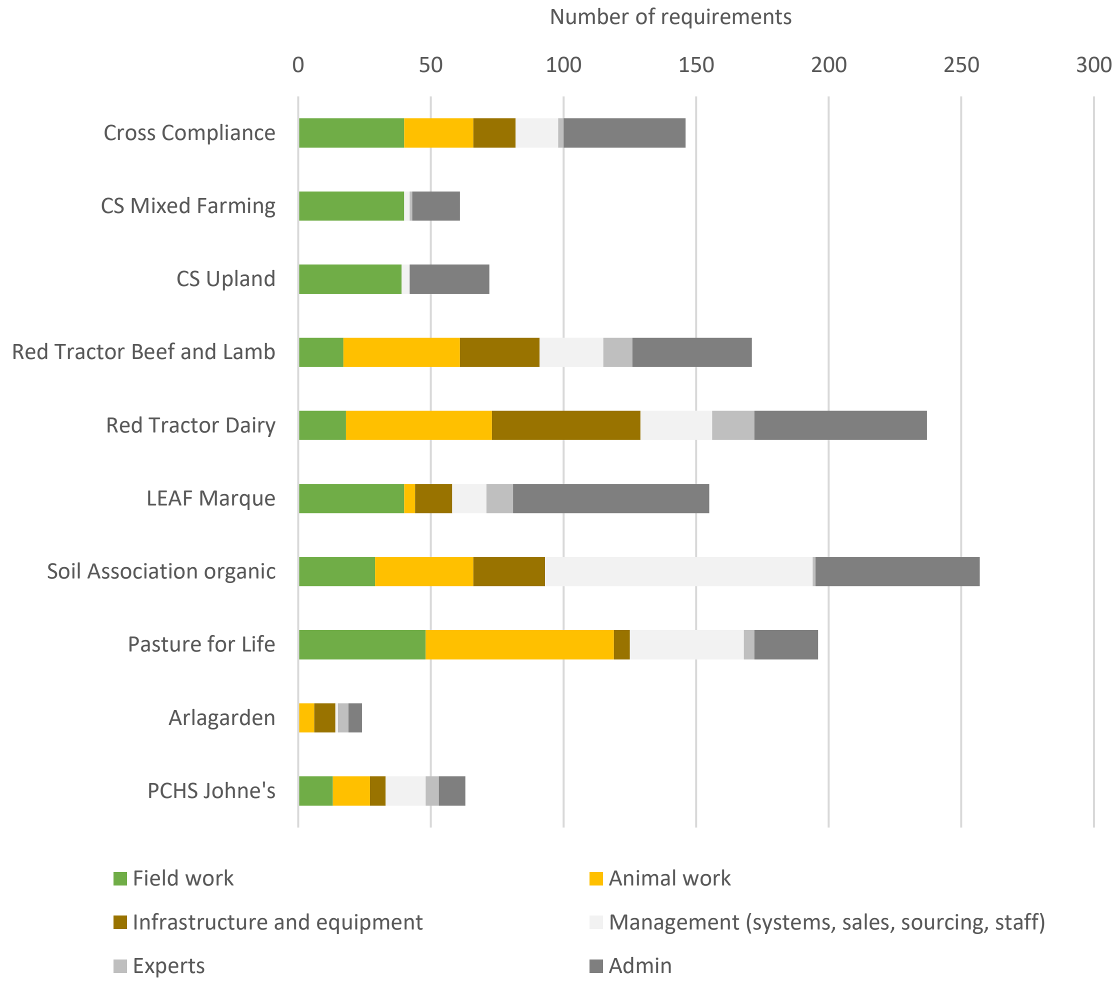

Figure 5.4. Types of activity involved for requirements in each scheme
Compiled by author
CS = Countryside Stewardship

These findings must be interpreted with caution. The classification gives an idea of the type of work that farmers must do to comply with requirement schemes. However, the analysis does not factor in the time that compliance with each requirement takes. Scheme requirements are not standard units of time; one requirement might take 10 minutes to complete, another might involve regular, recurring work throughout the farming year. A few requirements are about *avoiding* work rather than *doing* work. Such requirements could be time-saving for farmers, although in some circumstances they could create work in other areas – for example, having to devise measures of weed control without spraying pesticide.

Across all schemes, the requirements concerned with animal welfare mostly involve operational farmwork – that is, work with animals, infrastructure and equipment. Addressing animal health issues, however, involves a wider range of activities including engaging with veterinary experts and establishing systems of disease control. For environmental topics such as biodiversity protection or restricting nutrient losses, farmwork in the shape of field operations and work on infrastructure and equipment is needed for around 50% of the requirements, but a fair bit of administration and systems work is also needed.

Detail of the type of activity in each topic group is presented for each scheme in Appendix 8.

Operational work

All but one of the schemes impose restrictions on how field operations are carried out. The largest proportions of fieldwork requirements were identified in the schemes which emphasise environmental sustainability, such as the Countryside Stewardship Mixed Farming scheme, where 66% of all requirements were categorised under field operations, the Upland scheme (54%), Cross Compliance (27%) and LEAF Marque (26%). They include rules to prevent run-off and water pollution, farming practices to benefit biodiversity and requirements for grazing such as avoiding grazing for a specified interval after muck-spreading.

The schemes that focus more on animal health and welfare, such as Red Tractor, set many requirements involving work with livestock. Animal-related activities account for 26% of all requirements in the Red Tractor Beef and Lamb Standard, 23% in the Red Tractor Dairy Standard and 25% in the PCHS scheme. The largest proportion of animal-related requirements is found in the Pasture for Life standard: 36%, representing 71 individual requirements largely concerned with protecting the welfare of animals who are grazed permanently outdoors with minimal use of antibiotics.

The dairy schemes in particular also have multiple requirements that involve work on farm infrastructure, buildings, storage, machinery and equipment. They account for 33% of the Arlagarden requirements and 24% of the Red Tractor Dairy standard. Such requirements often relate to avoiding contamination for food safety or segregation of certified produce. They also refer to housing and equipment involved in caring for youngstock and other housed livestock.

Operational requirements are often rules for farmers to avoid rather than carry out an activity. Examples include rules to limit application of fertiliser or pesticide; to avoid grazing, gorse-burning or other field operations at certain times of the year; to limit the timing and frequency of hedge-cutting; or to avoid certain husbandry tasks such as castration or disbudding. Other requirements set limits, such as the amount of inorganic fertiliser that may be applied or the stocking density allowed on certain ground.

Administration

The requirement schemes involve substantial demand for administrative activities. The percentage of requirements categorised as 'Admin' ranges from 11% of all requirements in the Pasture for Life scheme to 23% in LEAF Marque. The kind of administration that the schemes require varies (Figure 5.5). All of them require farmers to keep records and other documentation: typical 'paperwork', although some of it may be done online these days.

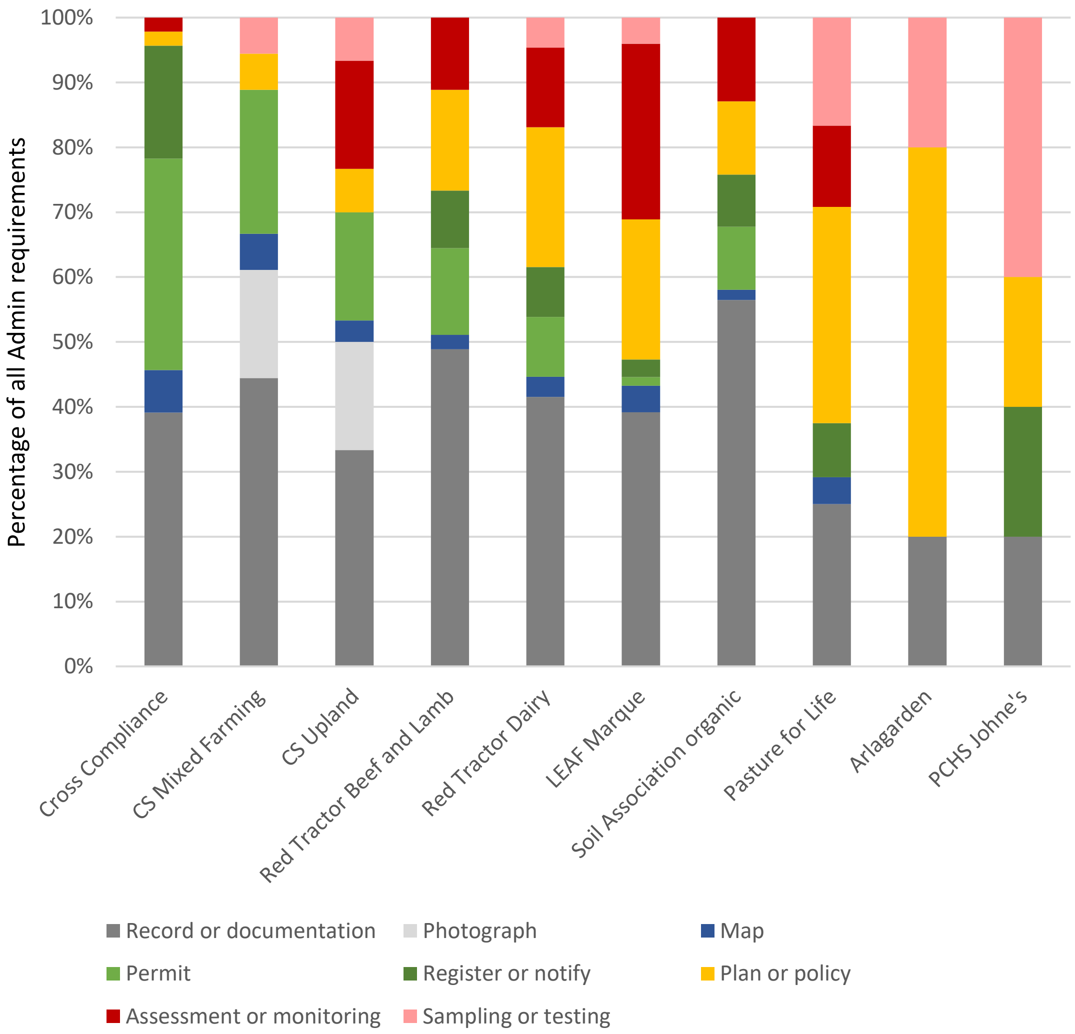

Figure 5.5. Breakdown of administrative activities required by each scheme
Compiled by author
CS = Countryside Stewardship

The more regulatory schemes, Cross Compliance, Countryside Stewardship and PCHS, have a fairly large proportion of requirements for farmers to obtain a permit, licence or certificate, or to notify a statutory or certification body. Many of these requirements would not apply to most farmers, as they would only need to do them if they wanted to deviate from the rules or do something unusual.

In contrast, the specialist private-sector schemes such as LEAF, Pasture For Life and Arlagarden place more emphasis on asking farmers to devise a plan or policy; to carry out monitoring and assessment, such as monitoring animal lameness or conducting a pollution risk assessment; and to do sampling and testing, such as soil testing, forage testing or faecal egg counts.

As we saw in Figure 5.4, the private-sector schemes (Red Tractor, LEAF Marque, Arlagarden, Soil Association and Pasture For Life) also include a relatively large number of requirements for farmers to engage the services of an expert (often a vet), and/or to have management systems in place, such as control systems or staff training. Much of the management systems work required by schemes is for the purposes of ensuring the integrity of the scheme itself. Altogether, the private-sector schemes require more advanced management of farming operations than Cross Compliance. Many of their requirements demand a high level of knowledge and skill of farmers and their staff, sophisticated management systems and planning, and the capacity for complex operations. Activities such as conducting tests or consulting the vet are also likely to be more costly than record-keeping or notifying an authority.

PCHS, too, has a relatively large proportion of requirements that involve control systems, testing and consulting a veterinary expert. These reflect that PCHS is a programme for certifying herds as disease-free. As such, it is different from the other private-sector schemes analysed here, as it entails veterinary testing and a herd inspection to ascertain compliance, rather than the on-farm inspection of farm documents and premises that is more common.

5.2.1.4 Sheep, beef cattle and dairy

Most requirements in the schemes apply to all farms with livestock, but some are specific to the type of enterprise: dairy, beef or sheep. Typically, there are slightly more requirements for cattle, especially dairy cattle, than sheep (Figure 5.6). This is largely due to animal health requirements concerning cattle diseases such as TB and BVD; animal welfare requirements for calves, youngstock and housed animals in general, which are typically cattle not sheep; and food safety requirements concerning milk production. Dairy farms typically have a whole range of buildings and equipment for housing and milking cows that specialist beef and sheep farmers do not have and which are covered by rules on cleaning, maintenance and welfare.

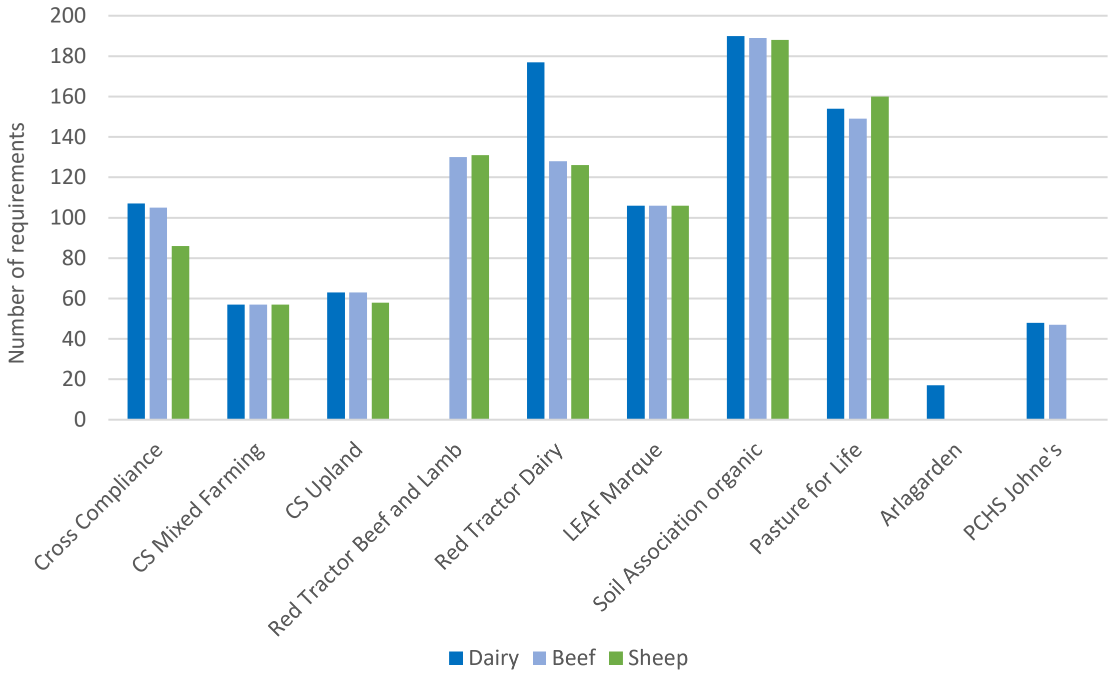

Figure 5.6. Number of requirements in each scheme applicable to dairy, beef or sheep
Compiled by author. The same requirement might be applicable to more than one livestock type
CS = Countryside Stewardship

The Red Tractor dairy standards, for instance, are 54 pages long, compared with 45 pages for the beef and lamb standards. They have an extra section on milk production and longer sections on feed and water, animal health and welfare, animal medicines and husbandry procedures. The latest version of the dairy standards requires farmers to have BVD and Johne's disease programmes and for their herd health plans to be signed off by a vet, which is only a recommendation in the beef and lamb standards.

Pasture For Life is unusual in setting more requirements for sheep than cattle; it includes detailed rules covering when and how farmers can waive the condition for all feed to be pasture-based to meet the special nutritional needs of pre-parturient ewes. Other sheep-specific requirements in the schemes cover subjects such as tail docking, the weaning of lambs or the disposal of sheep dip.

5.2.2 Supermarkets' unpublished schemes

5.2.2.1 Identifying requirements

The supermarkets' bespoke requirement schemes for direct suppliers are not publicly available. However, the supermarkets do publish online information about their commitments to sustainable sourcing from UK farmers, their requirements of suppliers and their outcome measures or key performance indicators (KPIs). The compiled information gives a useful but incomplete insight into what supermarkets require from their dairy and meat producers.

All seven of the supermarket groups reviewed here stipulate that direct suppliers must have Red Tractor certification as a baseline minimum requirement. In 2017, Marks and Spencer announced that its 40 dairy suppliers in its M&S Milk Pool would also be required to meet RSPCA Assured Standards, in addition to Red Tractor and its own Select Farm standards (Halleron, 2017).

5.2.2.2 Thematic coverage

There is heavy emphasis on animal health and welfare in the supermarkets' publicly available information. Compare Figure 5.7 below with Figure 5.2 on page 108. Environmental sustainability is mentioned very rarely. It may be that environmental requirements are included in the bespoke schemes, but not publicised.

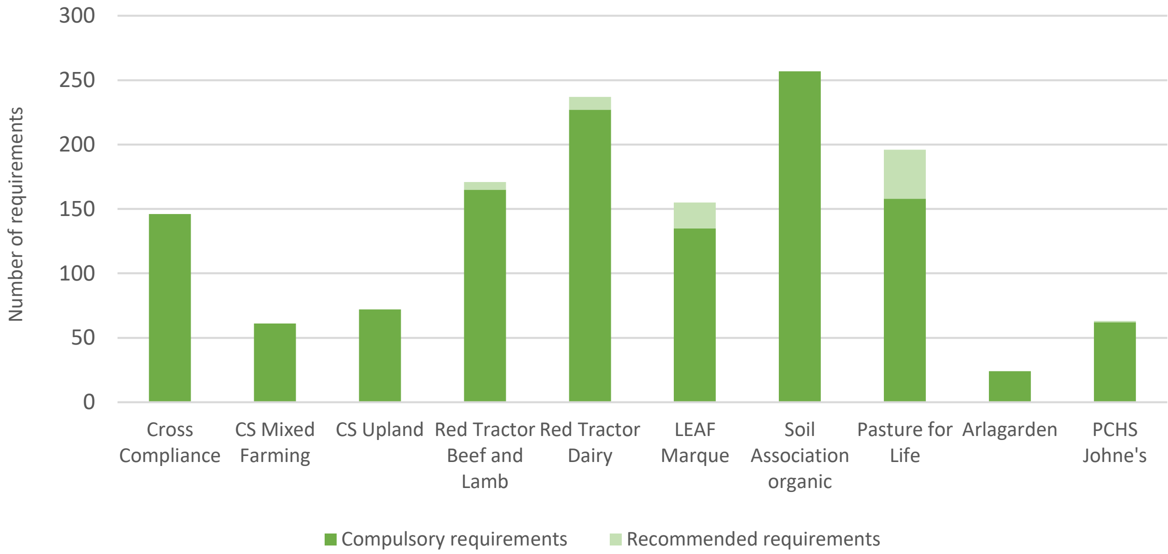

Figure 5.7. Topics of publicly available supermarket requirements or commitments
Compiled by author

Perhaps supermarkets emphasise animal welfare over environmental issues in their bespoke schemes, and certainly in their public documentation, because of the strong consumer interest in animal welfare (Nicholas et al., 2014). Morrisons, for example, has stated:

> "Sourcing well, securing British supply and maintaining high standards of farm animal health and welfare remain important issues for customers; they all make good business sense. Animal welfare remains a key area of interest, staying within the top of the most important issues considered by… 4,000 shoppers surveyed" (Morrisons, 2020:2).

Supermarkets' procurement and sustainability teams may feel less private-sector action is needed because the environmental impacts of UK farming are already governed through Cross

Compliance and AES. Or it could be that farmers' practices in animal health and welfare are easier for supermarkets to observe, quantify and change than field operations that relate to environmental aspects such as biodiversity or regulating ecosystem services. It appears that action on environmental issues is tackled by supermarkets piecemeal through their producer groups, rather than systematically through their bespoke requirement schemes. The Co-op has introduced a carbon footprint initiative among its producer groups, for example.

5.2.2.3 Type of activity

Although it was not possible to access the supermarkets' specific requirement for direct suppliers, it is clear from the publicly available information that the supermarkets impose additional requirements in livestock monitoring and data collection. These data must be reported to the supermarket using IT systems, such as Sainsbury's online Herd Health portal (Sainsbury's, 2020). This is a little different from the records – often literally paperwork, rather than anything digital – that schemes such as Cross Compliance and Red Tractor expect farmers to keep and collate for inspectors. To comply with the supermarkets' requirements, farmers need IT literacy and the 'infrastructure' for regular data capture, reporting and analysis. Dairy farmers are already asked by buyers to record and report data for milk quality purposes, and so they may have the systems necessary for sophisticated monitoring. An example of this is found with the First Milk dairy cooperative, which provides a smartphone app for its farmers to submit and analyse dairy enterprise data (First Milk, 2019). Beef and sheep farmers might not have the monitoring infrastructure in place. Waitrose (2017) says it has held workshops for its sheep producers to promote electronic recording of medicines, while the Co-op has developed a system for its lamb suppliers to capture data "for each lamb that is supplied to us" (Co-op, 2020).

The purpose of the supermarkets' data requirements seems to be to enable them to monitor compliance, but also measure and publicly report on progress against KPIs. This motivation is different from the purpose of the record-keeping required by the government and third-party schemes, which is to verify compliance. Supermarkets may want to track the performance of individual suppliers over time, and if necessary decide to stop sourcing from poor performers.

5.2.2.4 Sheep, beef cattle and dairy

Even more so than the 10 published requirement schemes analysed above, the supermarkets seems to impose more scrutiny and more requirements for dairy farmers than beef or lamb farmers. For example, Sainsbury's says it audits its dairy suppliers against a bespoke set of animal welfare standards, but not its beef or lamb suppliers. Morrisons requires its dairy suppliers to have CCTV on their farms "to help provide extra governance and insight into animal welfare, staff welfare and farm safety" (Morrisons, 2020:10). Some of the supermarkets have established integrated systems whereby male dairy calves enter their beef supply chains (e.g. Co-op Integrated Calf Scheme).

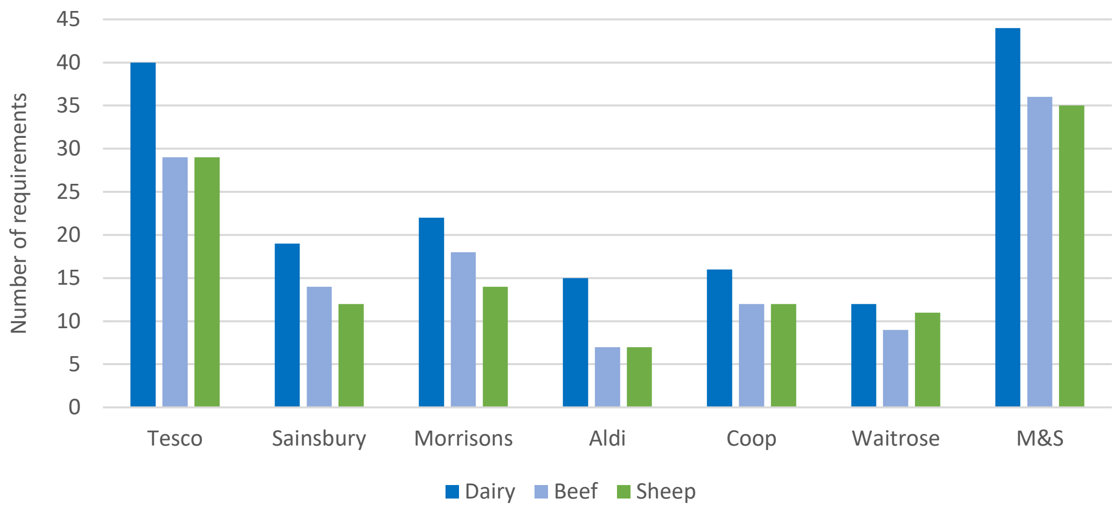

Figure 5.8. Number of publicly available supermarket requirements or commitments applicable to dairy, beef or sheep
Compiled by author. The same requirement might be applicable to more than one livestock type.

5.3 Overlaps in requirements

5.3.1 Legislative overlap

A substantial proportion of Red Tractor requirements are also legal requirements. For example, Red Tractor stipulates that manure heaps are 10 metres from a watercourse, animals are checked daily and fertiliser equipment is calibrated – these are all rules under Cross Compliance. In total, 46% of the requirements in the Red Tractor Beef & Lamb standards and 43% of the Dairy requirements are very close to rules in Cross Compliance or separate legislation; partial overlaps and overlaps with non-legally binding recommendations account for a further 13% and 16% of the requirements, respectively. There is a small amount of overlap in the other published schemes (Figure 5.9).

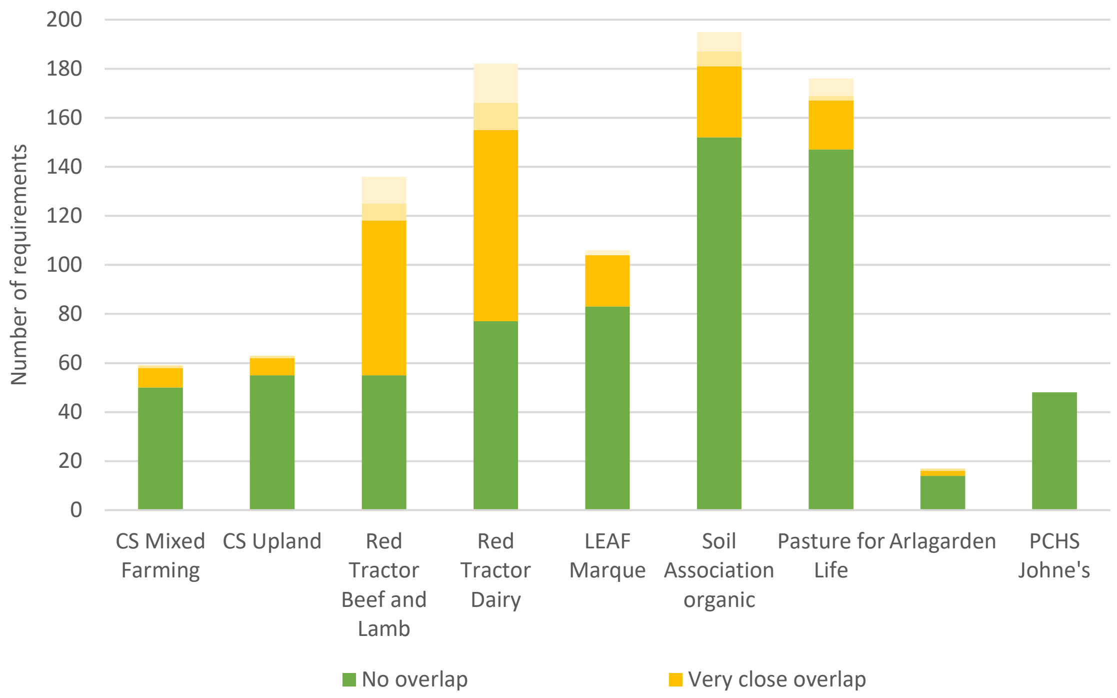

Figure 5.9. Extent to which scheme requirements overlap with legal requirements contained within Cross Compliance or separate legislation

Created by author

Most of the Soil Association requirements are also aligned with EC rules on organic production. CS = Countryside Stewardship

The overlap confirms that Red Tractor is acting as a devolved private-sector mechanism for verifying compliance with statutory laws (Clark et al., 2016; Bowen et al., 2020). Indeed, in its 2015 annual report, Red Tractor Assurance stated that it was "lifting the burden of regulatory inspections" (Red Tractor Assurance, 2016:6). Given that every farm participating in Red Tractor undergoes an inspection at least every 18 months, whereas only a small sample of farms are visited by inspectors from the authorities (see section 5.4), Red Tractor inspections reach a much larger number of farmers. Thus, the role of verifying compliance with the overlapping laws is largely transferred from the state to private certification bodies in a form of co-regulation (Garcia Martinez et al., 2013). It also means that legislative requirements which are not covered in Red Tractor standards, such as workers' rights, are not part of the private-sector verification and therefore may be less scrutinised overall. Ten years ago Lewis et al. (2011) found that private-sector farm assurance schemes neglected certain areas of environmental policy including carbon footprinting and air pollution, which remain under-represented among today's schemes.

The overlaps with legal requirements tend to concern farming activities, such as field operations or work on infrastructure and equipment, while the additional rules more often involve administration and management systems. That is, under Red Tractor, farmers may be asked to carry out many of the same operational practices on the farm that they are asked to do under Cross Compliance, but to do additional admin or management tasks.

There is also a small amount of overlap with legislative requirements among the supermarkets' commitments and requirements (Figure 5.10). They include requirements for animal mutilation procedures to use pain relief, a ban of growth promoters and prompt treatment of sick animals – all already requirements under UK law.

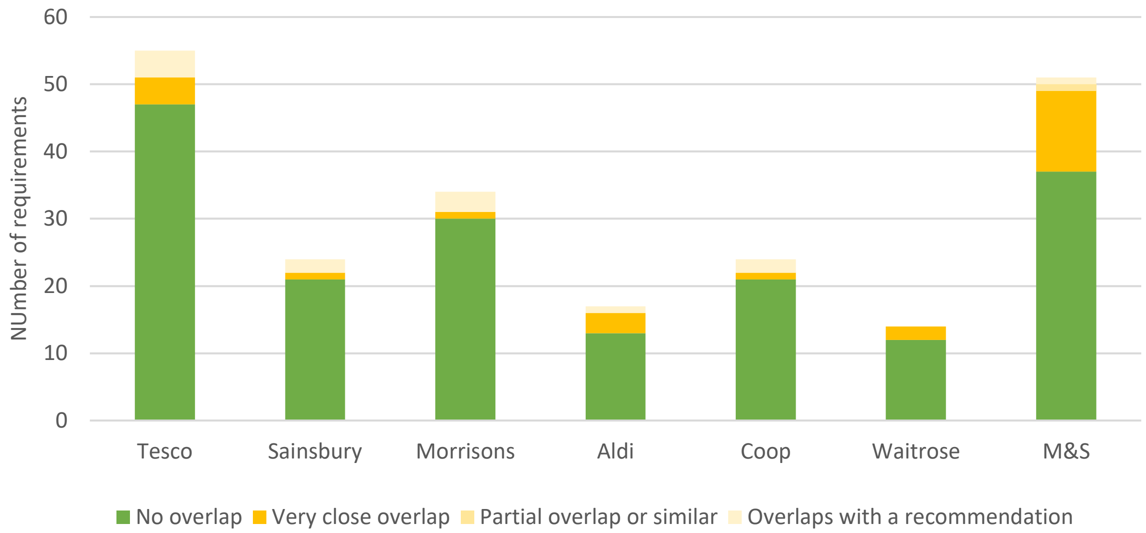

Figure 5.10. Extent to which supermarket requirements and commitments overlap with legal requirements contained within Cross Compliance or separate legislation
Created by author

5.3.2 Red Tractor overlap

As mentioned earlier, Red Tractor is often treated as a minimum standard that buyers and other farm assurance and certification bodies add on to. Despite this, show that some schemes and supermarkets do also repeat some Red Tractor requirements. Many of the most common areas of overlap concern animal health and welfare. Several schemes repeat the Red Tractor requirements to have a livestock health plan, for Critically Important Antibiotics to only be used as a last resort and for people who work with livestock to be competent and trained. Some schemes and supermarkets duplicate legal and Red Tractor rules for farmers to record applications of pesticide and antibiotics, and to ensure that grazing livestock can access shelter and shade. Some of the supermarkets also repeat the requirement in Red Tractor's dairy standards for their milk suppliers to have a plan to tackle BVD and Johne's disease.

5.3.3 Additionality and repetition

Despite these areas of overlap, most activities demanded by the additional schemes and supermarkets are *not* already covered by Cross Compliance or Red Tractor. So what are these additional areas of compliance for farmers? The sheer number and diversity of requirements makes it impossible to answer this comprehensively in a concise way, but Appendix 9 summarises the standout requirements that go beyond Red Tractor and legislation.

The findings show that many supermarkets and specialist certification schemes are making advanced commitments on aspects of animal welfare. Private-sector schemes are also addressing non-statutory diseases for beef cattle and sheep. Similarly, Countryside Stewardship and the environmental or eco-extensive schemes such as LEAF Marque or Pasture For Life are providing incentives for advanced work on environmental sustainability. There is some cross-over between animal welfare commitments and environmental goals in the small number of additional requirements on grazing-based systems and greenhouse gas monitoring that were identified in the analysis.

The findings suggest that private-sector schemes impose a substantial amount of additional admin and management systems work. We saw that Red Tractor requires comprehensive record-keeping, as well as several plans and policies, and annual staff and vet reviews. LEAF Marque also has a heavy administrative load, much of which relates to plans, systems and records for field operations and soil management. Furthermore, each scheme has its own requirements to manage compliance with the scheme itself. When the schemes involve segregation of certified produce or livestock, such as Pasture For Life or Soil Association organic, these requirements can be very numerous.

The consequences of the overlaps and additionality for farmers who participate in more than one scheme are likely to mean they face a combination of:

(a) Practices and paperwork requirements that overlap and only need to be done once.
e.g. Livestock tagging for Red Tractor following Cross Compliance rules; use the herd or flock health plan developed for Red Tractor to comply with a request from Tesco; conduct soil testing for both Pasture For Life and Countryside Stewardship;

(b) Practices and paperwork requirements that overlap or are similar but must be duplicated.
e.g. Collate and submit similar dairy data for buyers and local authority inspectors; conduct a review for Countryside Stewardship which is similar to a risk assessment required by LEAF Marque; undergo separate inspections for each scheme; and/or

(c) Practices and paperwork requirements that are specific to each scheme.
e.g. Add Johne's disease control measures for PCHS; take photographs for Countryside Stewardship; document organic segregation systems for the Soil Association.

5.4 Inspections, payments and costs

To verify compliance with statutory requirements, there is a network of local and national government authorities that conduct farm inspections, including the RPA, the FSA, the Animal and Plant Health Agency, the Environment Agency and Trading Standards (Clark et al., 2016; Defra, 2018b). State bodies typically only inspect a small sample of farms in England and Wales (Table 5.2). The number of inspections by local Trading Standards inspectors fell during the 2010s owing to a decrease in funding (Defra, 2018b:42). The private-sector schemes typically conduct an inspection for every participant over the assurance period, usually 12–18 months. The schemes may employ an independent certification body – hence ‘third party’ – but the supermarkets may employ second-party assessors or even send their own staff.

Duplication can occur if farmers receive inspections from more than one authority (Defra, 2018b). Increasing the co-regulatory role of Red Tractor in the enforcement of legislation, as discussed above, has further increased the potential for duplication in inspections. A review for Defra in 2018 found: “Currently, farmers and land managers give similar information to several bodies in the Defra group, and repeat information periodically to the RPA. They also give information to farm assurance scheme auditors” (Defra 2018b:58). To reduce overlaps, the Earned Recognition initiative has reduced the frequency with which Red Tractor-assured businesses receive a state inspection (Defra, 2013; Garcia Martinez et al., 2013; Defra, 2018b). For example, dairy enterprises that are assured under Red Tractor receive a dairy hygiene inspection from the FSA every 10 years, but this rises to every two years for non-farm assured enterprises.

Duplication can also occur if farmers are inspected against multiple private-sector schemes and are asked to produce the same or similar information each time. To help address this, some standards bodies have reached agreements whereby an inspection for more than one scheme can take place on the same day, such as an organic inspection being combined with a Red Tractor inspection.

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Table 5.2. Inspections, costs and compensation for requirement scheme participants
Compiled by author from various sources

Scheme	Cost	Inspection regime	Compensation (actual or potential)
Cross Compliance	None	Inspections conducted by RPA and APHA on 1% of holdings every year Overlapping statutory inspections by FSA, Environment Agency or Trading Standards	Qualifies farm to receive annual Basic Payment: £162/ha (Severely Disadvantaged Area), £163/ha (lowland and non-SDA)
Countryside Stewardship	None	Administrative record checks Inspections conducted by RPA on a sample of agreement holders	Annual compensation payment for income foregone, any capital items and transaction costs, including costs of participation
Red Tractor	SAI, Beef & Lamb: Membership: £163/year Royalty fee: £35/year Site visit: £30 (estimate) Costs for dairy farmers may be paid by buyer	Initial self-assessment checklist Farm inspection every 12-18 months	May be required for mainstream market access Potential sales premium at livestock auctions May reduce likelihood of receiving a statutory inspection under Earned Recognition
LEAF Marque	Membership: £113-£442/year, based on hectares Inspection: from £225, depending on whether it is conducted together with another scheme audit	Online self-assessment Farm inspection every 12 months	Potential market premium for LEAF produce
Soil Association organic	Application and conversion: £517.20 Certification: £768	Farm inspection every 12 months Includes 10% unannounced inspections and 10% advanced risk-based inspections	Qualifies farm to receive government support payments: £50-175/ha (depending on land type) for organic conversion or £8-65/ha (depending on land type) for remaining organic. However, farm must be in Countryside Stewardship to access them Potential market premium for organic produce
Pasture For Life	Membership: £100/year Inspection: £375-£475 depending on enterprise; £250 if already certified organic by OF&G Sales levy if farm sells PFLA-certified produce	Self-assessment followed by farm inspection at least every 12 months	Potential market premium for Pasture For Life produce
Arlagarden	None	Farm inspection alongside Red Tractor inspection every 18 months	Part of contract with Arla Farmers may receive higher milk price for meeting additional advanced requirements such as Climate Check (Arla Foods, 2019)
PCHS (Johne's)	Membership: £75/13 months Blood test: £4.20 PCR faecal test: £30.90	Herd inspection and laboratory tests Farm visits conducted by CHECS auditors on a random sample of farms	No compensation, but surveyed members estimate mean benefit of £35 per herd for commercial and pedigree sales If also accredited under the TB Herd schemes, reduces frequency of statutory TB testing

5.5 How schemes have changed over time

Given that Research Question 1 concerns how workloads on livestock farms are changing, it is important to consider how external requirements have been changing over time. It is possible to do this by comparing older versions of published standards.

Cross Compliance rules for England are published every year. The 2005 rules placed a heavy emphasis on sustainable land management (Figure 5.11); hence most activities involved field operations (Figure 5.12). A large percentage of these (41%) were rules to *avoid* an activity – not shooting wild birds, not applying inputs at certain points of the year, and so on. Around 2011, new rules on the welfare of calves and animal welfare more generally were added. There was also an injection of new requirements on food safety and traceability. In the latest iteration for 2020 we see proportionally less work required on infrastructure and equipment, and proportionally more work required on admin and management systems. Only 12% of the 2020 requirements are about avoiding activity. Thus, the number of requirements that livestock farmers face under Cross Compliance has remained largely the same since around 2011, but the proportion of requirements involving administrative work and management systems has increased.

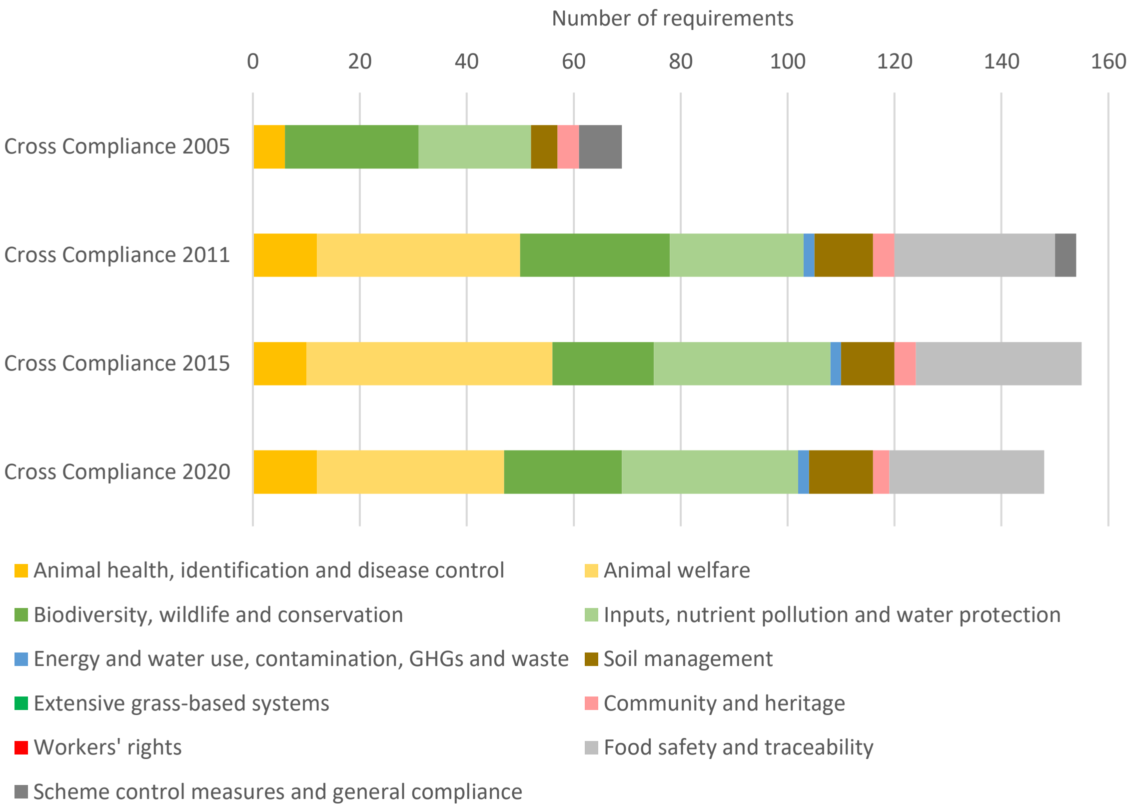


Figure 5.11. Comparison of topics of requirements in Cross Compliance for selected years
Compiled by author

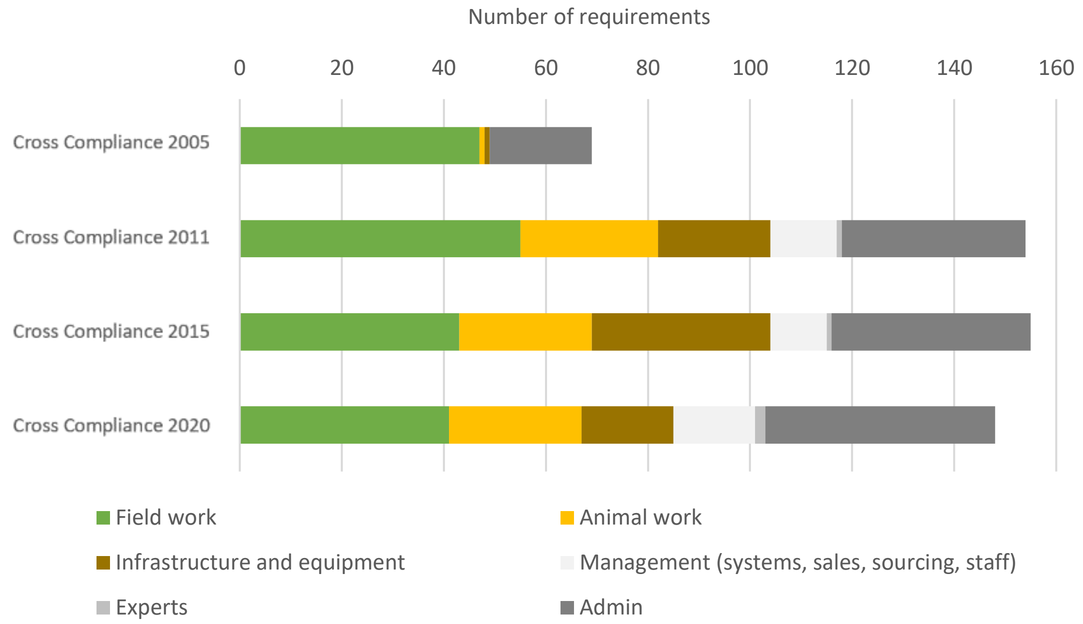


Figure 5.12. Comparison of types of activity required under Cross Compliance for selected years
Compiled by author

For an idea of how Red Tractor schemes have changed over time, the Red Tractor Dairy standards of 2019 were compared with the version from 2010, which is the first year in which the old Assured Dairy Farms standards were published under the Red Tractor banner. Only requirements for dairy cattle were included to ensure a like-for-like comparison.

The 2019 version of Red Tractor Dairy has more requirements overall and the proportion of requirements on animal health and disease prevention has grown (from 16% to 26%), while the proportion on food safety and traceability has shrunk (from 45% to 28%) (Figure 5.13). The 2019 version involves more administration and proportionally fewer activities relating to buildings, machinery and equipment, most of which had been required to ensure milk safety and hygiene. Also there are now proportionally more field-operation activities in the Red Tractor standards, reflecting greater scrutiny of the welfare of grazing livestock and an increase in requirements concerned with inputs, nutrient pollution and water protection.

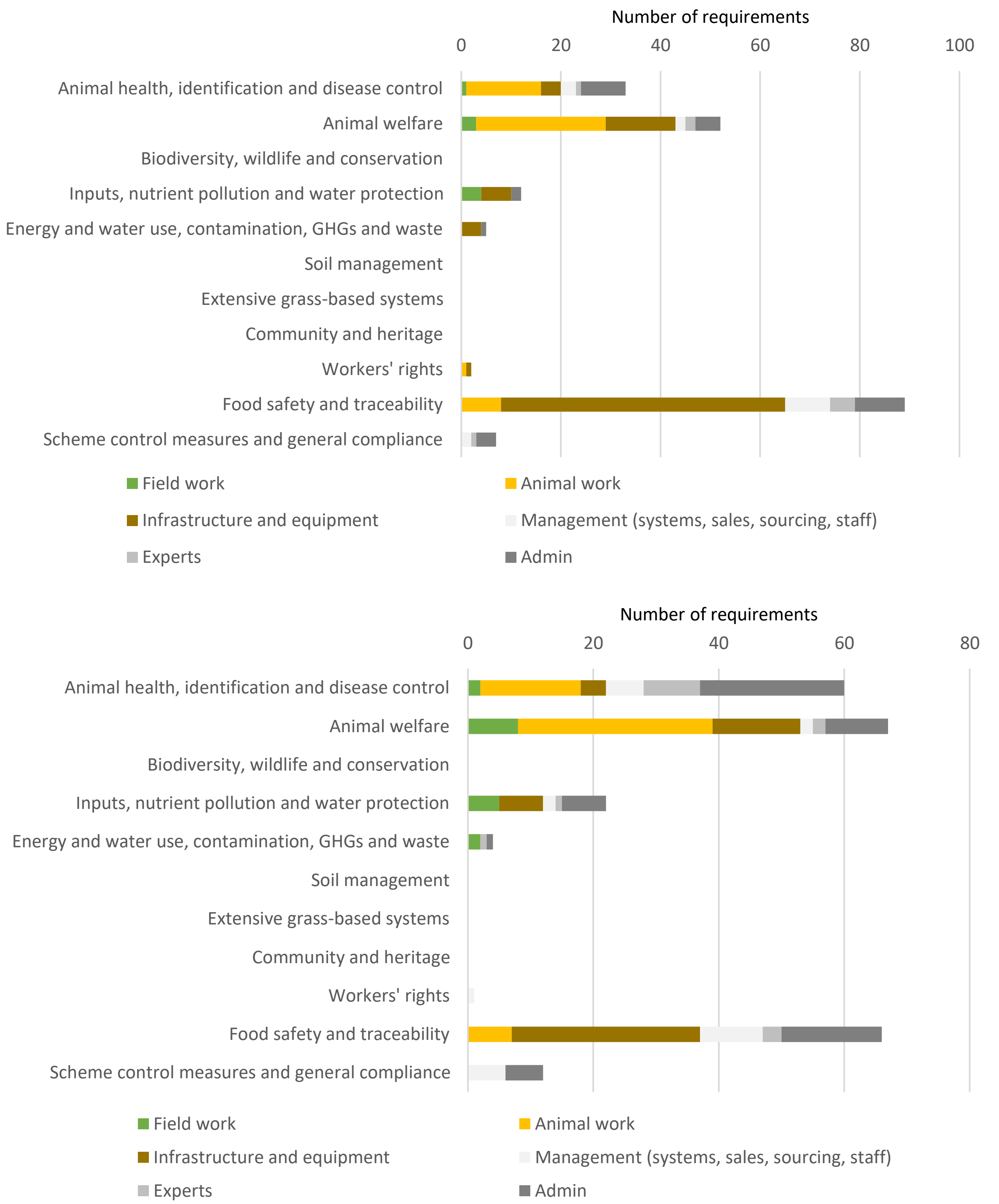


Figure 5.13. Comparison of types of activity required by Red Tractor Dairy standards in 2010 (top) and 2019 (bottom) Compiled by author

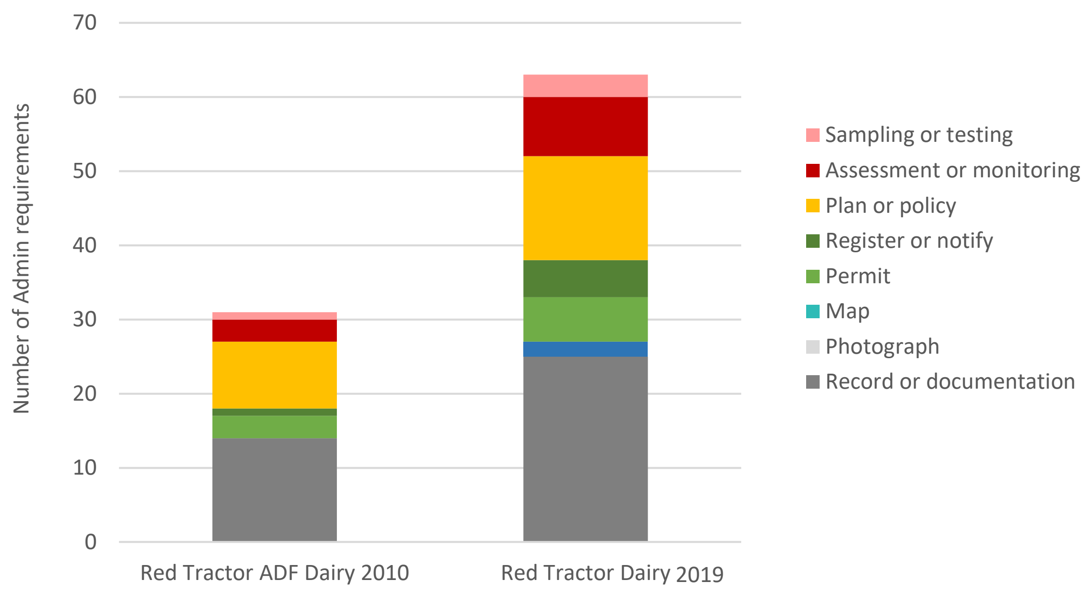


Figure 5.14. Types of admin work required by Red Tractor Dairy standards in 2010 and 2019
Compiled by author

Among the requirements for administration, the 2019 standards require proportionally fewer records and documentation, plans and policies than the 2010 version, and proportionally more registrations or notifications, maps, assessment and monitoring, sampling and testing (Figure 5.14). A new rule in the 2019 Dairy standards for farmers to co-write their herd health plans with their vet contributed to the larger proportion of requirements that call on engagement with experts compared with the 2010 version. Although this is not yet required of beef and sheep farmers, in 2018 a new requirement was added to the Beef & Lamb standards for a vet to conduct an annual health and performance review (Red Tractor Assurance, 2018b). This trend of requiring greater veterinary involvement can be observed with previous Red Tractor versions (Cooper, 2014) and other schemes too (e.g. Soil Association, 2020c), and, since vets may charge for their services, implies an increase in the cost of participating in external schemes. This is clarified in Red Tractor documentation as follows:

> "You are responsible for any external third-party fees required to meet the requirements of the Standards (for example, Quarterly Veterinary Reports)… You are responsible for any costs you incur in meeting the Standards and rectifying non-conformances" (Red Tractor Assurance, 2018a).

As versions are revised over time, we observe Red Tractor and other schemes adding more detailed guidance to requirements and for previous recommendations to become mandatory (e.g. PFLA, 2020a). Revisions do not always add requirements, however; sometimes rules are dropped – LEAF Marque removed a requirement for a Farm Environmental Plan in its latest iteration, for example – or relaxed, as can occur with permissible inputs for organic certification (Soil Association, 2020c).

Very often, changes to schemes have responded to new legislation, such as EU rules (ABM, 2009; Red Tractor Farm Assurance, 2010; Dale et al., 2014; FAWL, 2018). Other changes are driven by pressure from consumers, buyers or industry bodies – hence stricter requirements on antibiotics and tethering and the emergence of more requirements on soil management or plastic packaging, for example; or to bring standards closer in line with one another for earned recognition (FAWL, 2018; Red Tractor Assurance, 2018c; RUMA, 2019; Soil Association, 2020c). Often the revisions introduce advanced requirements that supermarkets and processors such as Arla had already committed to. For example, it is likely that the Red Tractor Dairy scheme will add a requirement for farmers to have a breeding policy and calf mortality records to eliminate euthanasia of male calves by 2023, in response to external pressure (Red Tractor Assurance, 2020) – but supermarkets such as Sainsbury's and Morrisons have already introduced policies to this end. Third-party standards are designed under the principle of 'continuous improvement' (ISEAL Alliance, 2020; e.g. Smith, 2021), an approach which demands and justifies constant revision and addition.

Changes are also made with the intention of making assurance and certification schemes more effective in changing behaviour and raising standards. Note, for example, the way that some rules in the latest LEAF Marque have changed from requiring evidence of policies to evidence of implementation. Thus, from "There is *a general policy* to conserve and build up soil organic matter" to "*Measures are taken* to conserve and build up soil organic matter". There is a related trend for more requirements in testing and monitoring. In the context of animal welfare, as well as using what researchers call "engineering-based" requirements, such as the large number of requirements on housing, buildings and equipment in the 2010 Dairy standards, schemes are increasingly using "performance-based" requirements involving animals themselves to assess compliance with welfare laws and norms (Defra, 2004b:4) – just as with Cross Compliance. Similarly, LEAF has introduced a new recommendation for soil health measurement and is adopting an outcome-based and management-based approach for its environmental standards (LEAF, 2020; Defra, 2018b).

5.6 Non-compliances

Some information is available on rates of compliance with Cross Compliance and Red Tractor standards. This gives an insight into which external requirements farmers find difficult or irksome to comply with.

In their review of Cross Compliance inspections conducted in England, Wales and Scotland during 2007–2013, Clark et al. (2016) identified issues with sheep and cattle ear tags as the most common cause of non-compliance. In 2018, data released by the RPA confirmed that animal identification and registration is a major area of Cross Compliance failures (Farming Advice Service, 2018). One type of failure was not informing the authorities of livestock movements and deaths within the prescribed period. It was also noted that “a number of farmers have received [Basic Payment] reductions in 2015 because the information that they had entered into [Cattle Tracing System] or their farm documents was inaccurate or incomplete” (ibid., p.2).

In 2014, the UK government published results from Cross Compliance inspections conducted in England during 2013 (GOV.UK, 2014a). Failures were often related to paperwork and management systems, namely incomplete record-keeping and reporting, failure to conduct soil reviews and failure to develop risk maps. Other non-compliances were for farm-work reasons: again failing to apply or replace livestock tags, plus incorrect storage and application of manure and slurry, and not using pesticides properly. Some of the non-compliances indicate a lack of time and staff, for example to keep precise records, conduct a risk assessment, maintain animal housing or check animals frequently, although the results do not suggest that a lack of time or staff affected compliance with calf welfare requirements under Cross Compliance.

Red Tractor Assurance has also reported that its Beef & Lamb members often fail to provide correct livestock identification documents, particularly for sheep (Red Tractor Assurance, u.d.a). As with Cross Compliance, it appears that rules on record-keeping are particularly difficult for farmers to comply with. In 2014, the commonest failures in the Beef & Lamb scheme were “small errors in the fine detail of… medicine records” (Red Tractor Assurance, 2014:9). Guidance for farmers highlights the need to keep medical, pesticide and waste disposal records updated, including when agricultural contractors are used; and to complete the livestock health plan, vermin control plan, manure management plan and emergency plan (Red Tractor Assurance, u.d.a). Non-paperwork requirements with poor compliance rates include maintaining farm buildings, having sufficient cleaning equipment, following grazing intervals, restricting livestock’s access to manure heaps, and regularly worming farm dogs (ibid.).

A Red Tractor Assurance document from 2019 lists the 10 most common non-compliances with its Dairy standards. Three involved paperwork and management systems: incomplete antibiotics usage records and the absence of reviews by a vet of herd health and of antibiotics (Red Tractor Assurance, 2019b). Record-keeping and health data collection are recurring challenges, but documents also mention non-compliance with requirements concerning dairy farm buildings and equipment (Red Tractor Assurance, 2015, 2019b). Guidance for farmers highlights issues with farm buildings and milking parlours, including “rusty fixtures and fittings” and “cobwebs and dust on higher level pipes” as indicators of unclean or unsound facilities (Red Tractor Assurance, u.d.b).

5.7 Summary

Livestock farming in England and Wales is highly regulated. This analysis suggests that farms with cattle or sheep face hundreds of prescriptions and proscriptions which are issued by a range of observers who claim a stake in how farming is practised, covering national government, local authorities and supply-chain actors (Box 2). Participating in voluntary schemes adds to the demands already faced by farmers who are complying with minimum statutory requirements.

Research Question 2 of this study asks, ‘What are the specific effects of external requirements, especially farmer requirement schemes, on workloads and the nature of farmwork?’. Altogether, the documentary analysis indicates that external requirement schemes may affect the workload on a livestock farm in two main ways. First: if complied with, the schemes influence how farming operations are carried out. This includes restrictions on the use of substances, the timing of operations and the upkeep of machinery, as well as more positive rules or guidance on the way that animals must be cared for and farmland must be worked. Such requirements set institutional expectations or norms for how livestock farming should be done, and are likely to be influencing the nature of livestock farming in the UK, even though they are mostly imposed from the outside. Over the past 10-15 years, there has been a substantial increase in the demands on livestock farmers in animal welfare, livestock disease prevention and input management, particularly for farmers in Nitrate Vulnerable Zones and farmers with cattle in high TB risk zones. The two most widespread schemes, Cross Compliance and Red Tractor, have both increased the number of requirements over time. While the Red Tractor standards still have substantial requirements for food safety and traceability, we can see how an initiative that originated as a mechanism for governing safety in food supply chains (Corsin et al., 2007) has become a major tool for promoting and upholding norms of animal welfare and disease prevention in UK agriculture. The findings support the observations of Toschi Maciel and Bock (2013) and Maye et al. (2014) that the private sector has become increasingly engaged in animal welfare governance in Europe.

While the analysis could not measure the time involved in complying with operational requirements, information on non-compliances suggests that farmers find refreshing bedding for livestock, maintaining equipment and complying with rules on the correct storage and application of inputs particularly time-consuming, or at least difficult to comply with.

Second, the schemes affect farm workloads by adding requirements for administrative work and inspections. In addition to farming-related paperwork, scheme participation also requires considerable work in managing control systems for the schemes themselves, particularly for standards such as organic that rely on strict segregation of certified inputs and produce.

Just as the topics of operational requirements have been shifting, there is also an observable shift during the past 10-15 years towards particular forms of administrative and management tasks to demonstrate compliance. Depending on which scheme(s) they participate in, livestock farmers are likely to be experiencing a growing demand for not only record-keeping and data capture, but also more sophisticated and potentially time-consuming and costly measures of planning, testing and monitoring. Requirements for writing plans and keeping records and livestock tags up-to-date are often not complied with, perhaps indicating that these are areas that farmers find burdensome.

Such changes may have consequences for the kind of work that farmers must undertake as scheme participants. It is increasingly difficult for farmers to comply with requests without some degree of IT literacy. This is partly intentional on the part of scheme proponents, who want farmers to use data and monitoring more systematically (Escobar & Demeritt, 2016; see Defra, 2014), although it is not clear if the scheme proponents have calculated the cost of extra time needed not only to carry out the work, but also to document it and undergo assessment against it.

A third, more indirect way in which schemes may be affecting workloads is through rules on farm infrastructure such as dairy parlours, youngstock housing or slurry storage. Some of these requirements, as well as many of the field operations, are likely to shape the commissioning of work by specialist agricultural contractors. Linked to this is another indirect impact, which is the cost of compliance. Notwithstanding that some schemes provide financial compensation, the analysis has identified wide-ranging financial costs such as scheme membership fees or veterinary consultation charges; these costs must be added to the farm balance sheet and thus detract from money available to spend on paid labour, which might result in an increase in the workloads of existing members of the farm workforce.

To date, the external requirement schemes have paid relatively little attention to the topics of carbon footprinting or soil management – although requirements in these areas are being made by the more advanced or progressive schemes and supermarkets. This means that if measures on carbon footprinting or soil management are introduced by schemes in future, this will be a wholly new area of compliance for farmers. Requirements on aspects of worker welfare such as health and safety are almost entirely absent. Bain et al. (2011) have criticised the GlobalGAP scheme for its scant requirements on worker health, safety and welfare – perhaps similar criticism could be levelled at the voluntary farm assurance schemes in UK livestock farming.

The analysis thus provides some evidence for helping to answer Research Questions 1 and 2 on the nature of livestock farming and the specific effect of requirement schemes on workloads. However, the evidence is limited since the analysis has covered the rules that farmers should follow, but it cannot tell us how much labour-time is needed or which rules are being adopted, save for a small amount of information on rates of non-compliance. Therefore the analysis presents the theoretical ways in which livestock farm workloads might be affected, rather than the actual impacts on workloads from putting the requirements into practice. It may be that external requirements schemes have only a small influence on farming workloads, either because the requirements take little time to implement or because farmers are simply not implementing them. To address this, it would be useful to assess the efficacy of audits and other forms of surveillance used by the scheme administrators. There was no scope to do so in the current project. However, the interviews presented in Chapter 8 provide an opportunity to assess impacts on workloads from the respondents' perspective. We can also observe in the meantime that: (a) although state inspections are rare, participants in Red Tractor and specialist voluntary schemes are visited at least every 18 months, and cattle farmers in TB zones at least every 12; and (b) the analysis suggests standards bodies are evolving their schemes to increase their confidence in uptake of and compliance with their requirements, such as through performance-based monitoring or rules that require evidence of implementation.

The expansion of the compliance landscape that this analysis has identified – the increase in the volume and sophistication of external demands on livestock farmers – is an important consideration for discussions on the strain of bureaucracy on producers. The analysis found that dairy enterprises face more requirements and are generally under greater scrutiny than beef enterprises and sheep enterprises even more so, partly because of serious cattle disease, partly because of milk safety concerns and partly because the use of contracts rather than spot markets for marketing milk makes it possible for their buyers to request close surveillance. To some extent it is within farmers' power to decide whether the rewards of participation in external schemes are worth the financial, psychological and labour-time costs involved, although when it comes to Red Tractor assurance, many may feel they have no choice but to participate because they could not access a viable route to market without it.

Box 2. Summary of the main things livestock farmers are being asked to do by external actors

Animal tagging

Paperwork and management

- Record-keeping
  - Animal movements, births and deaths
  - Medicine book
  - Purchased inputs; pesticide and fertiliser application
  - Staff training
- Testing, monitoring, assessment
  - Blood tests
  - Faecal egg counts
  - Animal health monitoring
  - Risk assessment before applying fertiliser
  - Maybe soil assessment, carbon footprint, energy use
- Plans
  - Write herd or flock health plan
  - Other plans and policies depending on their scheme
  - Farm and soil maps

Avoid practices at certain times of year

- Hedge-cutting
- Cutting for hay and silage
- Burning

Take care of livestock for disease prevention and animal welfare

- Improve field conditions for livestock: clean water troughs, clean lying areas, shelter and shade
- Check livestock frequently
- Follow rules on animal transport
- Refresh bedding of housed animals
- Take special care of youngstock
- Reduce their use of antibiotics, ideally also anthelmintics
- Consult their vet more often
- Use anaesthesia and/or use vets for mutilation procedures

Ensure field operations don't affect watercourses or biodiversity

- Manage watercourse buffers
- Restrict amount of fertiliser and pesticide
- Take care over manure heaps, slurry stores and input storage
- Avoid poaching, manage stocking densities
- Dispose of sheep dip and waste properly

Maintain buildings and equipment

- Keep place tidy and clean
- Control vermin without using permanent baits
- Keep buildings sound for housing animals and for milk production
- Disinfect and calibrate equipment (or check contractors have done that)
- Worm farm dogs

Follow scheme control measures

- Have systems for separation
- Follow rules on marketing
- Only purchase inputs (feed, medicines, disinfectants, pesticides, etc) from permitted sources
- Apply for Basic Payment and any agri-environment payments

Comply with commercial requirements

- Production: carcase quality and weight, milk quality
- Paperwork: maybe breed society documentation and reporting, cost of production records

Undergo inspections – both long-time pre-announced, and short-notice – and upload documents

- TB testing
- Red Tractor, any other certification bodies
- Authorities

6. Insights from the Farm Business Survey

This chapter presents findings from the second kind of secondary data reviewed for this study: an analysis of data from the annual Farm Business Survey (FBS) for England. The analysis provides evidence relating to Research Question 1, on the changing nature of work and labour systems in UK livestock farming; and Research Question 3, on the allocation of time and labour for managing workloads. It involves national-level FBS datasets from surveys of hundreds of farmers over the past 20 years. The data were reviewed to look for evidence to support the theories that were presented in the literature review and the conceptual framework. Specifically:

- Is there evidence that people who work on English livestock farms are working longer hours than in the past (e.g. because workforces have been reduced or because workloads from external requirements have increased)?
- Is there evidence for surplus labour and under-employment on farms, or for some farms' labour systems becoming stretched?

The approach to the analysis is explained in Chapter 3.3.2.

6.1 Working hours

The FBS measures the hours worked by most workers on the farm business over a 12-month period. The hours are estimated by the FBS survey administrator in close discussion with the participating farmer (Keith Robbins, personal communication, 11 February 2021). These data are therefore not a wholly reliable record of actual hours worked, and it is not clear how accurate the survey methodology is for capturing contingencies such as time spent on paperwork or unpaid overtime by paid workers. The analysis presented here can only serve as an estimate of what might be happening in farm workforces.

FBS Data Builder provides the average hours for five types of worker: principal farmer, their spouse, business partners, and full-time and part-time workers. It excludes casual workers as well as less common types of worker – spouses of business partners, farm managers and trainees. It does not measure hours worked by agricultural contractors.

Table 6.1 presents the average hours estimated for each kind of worker in each of the four study farm types in 2018/19. The results are broken down by farm size, which is measured using the theoretical SLR of the agricultural operation, as opposed to acreage or output (GOV.UK, 2014b). Very small part-time farms are excluded.

Table 6.1. Average hours worked on the farm business over 12 months by main types of worker in 2018/19, England, by farm type and size Data source: Farm Business Survey (RBR, 2021)

Farm type	Worker	All full-time farms	Small	Medium	Large	Very large
Dairy	Principal farmer	2,546	2,601	2,660	2,581	2,489
	Spouse of principal farmer	973		1,124	1,123	826
	Business partner	2,041		1,423	2,315	2,068
	Full-time worker	2,181		2,186	2,148	2,187
	Part-time worker	910		1,049	940	899
LFA	Principal farmer	2,023	1,897	2,176	2,124	2,104
	Spouse of principal farmer	675	494	740	818	984
	Business partner	1,607	1,139	1,655	1,586	2,044
	Full-time worker	1,800			1,575	1,920
	Part-time worker	1,005		1,202	1,005	905
Lowland	Principal farmer	2,110	2,007	2,204	2,337	2,208
	Spouse of principal farmer	678	598	601	1,169	784
	Business partner	1,484	1,350	1,360	1,790	2,330
	Full-time worker	1,972		2,245	1,715	1,866
	Part-time worker	763	762	1,046	680	681
Mixed	Principal farmer	2,285	2,048	2,508	2,438	2,407
	Spouse of principal farmer	755	507	1,007	842	933
	Business partner	1,613	1,545	1,509	1,502	1,823
	Full-time worker	2,069	1,861	1,663	2,113	2,161
	Part-time worker	880	737	1,077	723	978

Farm size is measured by estimated Standard Labour Requirement. 'Full-time' excludes very small and part-time farms.
Data Builder variables used: 'Time worked by [farmer][spouse] on farm business (hours/year)' and 'Average time worked by [business partners][full time workers][part time workers] (hours/year)'.
Except for the principal farmer, the average is the 'Average of farms with', since this sometimes differs from the average for all farms.
Average is for an individual person, not total hours worked when there are multiple business partners or full-time or part-time workers.
Cells are empty when data are not available from Data Builder.

As noted in the research design chapter (section 3.3.4.1), the standard number of hours used to classify a full-time worker in agriculture is 2,200 hours a year. For theoretical purposes, this can be used as a threshold above which a person moves from being fully occupied to being over-employed. Table 6.1 shows some workers on certain types of farm were estimated in 2018/19 to have averaged more than 2,200 hours a year and could therefore be described as over-worked:

- The principal farmer typically works the longest hours of everyone in the workforce.
- In some cases, over-employment is recorded for business partners and full-time staff.
- Workers in the dairy sector tend to work longer hours than workers in the other livestock farming sectors (Figure 6.1).

These findings are discussed in greater detail in the following sections.

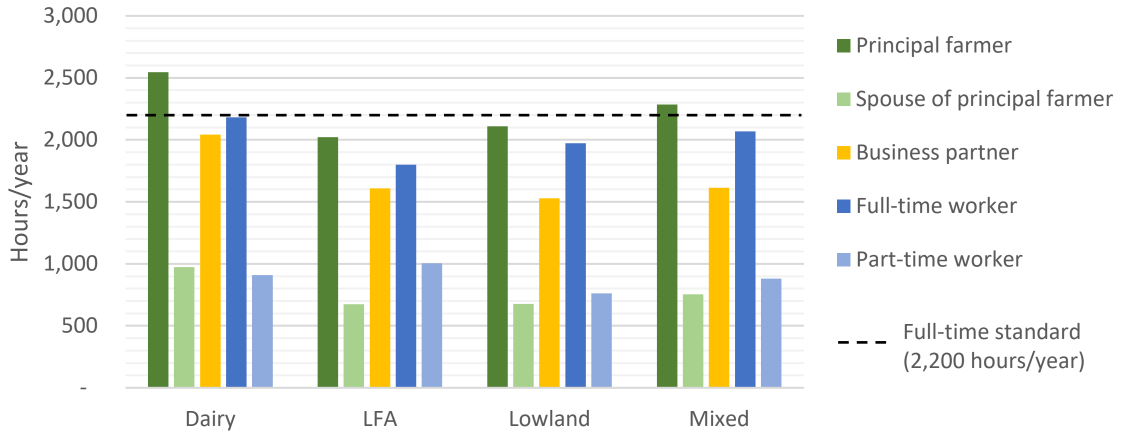


Figure 6.1. Average hours worked on full-time farms over 12 months by main types of worker in 2018/19, England, by farm type
Data source: Farm Business Survey (RBR, 2021)

Data Builder variables used: 'Time worked by [farmer][spouse] on farm business (hours/year)' and 'Average time worked by [business partners][full time workers][part time workers] (hours/year)'.
Except for the principal farmer, the average is the 'Average of farms with', since this sometimes differs from the average for all farms. Average is for an individual person, not total hours worked when there are multiple business partners or full-time or part-time workers.

6.1.1 Principal farmers

Every farm business in the FBS has a principal farmer. In 2018/19, almost all principal farmers recorded in the FBS were men (dairy: 95%, LFA: 94%, lowland: 92%, mixed: 95%).

Among dairy farms, the average hours worked by the principal farmer in 2018/19 were above 2,200 hours in every full-time size group, suggesting that over-work is widespread among principal dairy farmers. Over-employment is also recorded in the mixed farming sector, except on small farms. The size of the operation is related to the hours worked, and it is medium-sized farms where principal farmers worked the longest hours in 2018/19, except in the lowland sector, where the highest average hours were recorded on large farms. It is mostly only small full-time farms and very small part-time farms where average hours are typically under 2,200/year, except in dairy, and thus indicate under-employment.

The FBS captures time spent by the principal farmer on any off-farm employment. On average, principal farmers do not spend a large amount of time working outside the farm business. In 2014/15, the average hours from off-farm employment were 50 on the average LFA and mixed farm, and 80 on the average mixed farm (a figure for dairy was not available). Where principal farmers work less than 2,200 on the farm business, it is therefore unlikely that off-farmwork is pushing them into significant over-employment.

Typically, the older the principal farmer, the fewer hours they work (Figure 6.2) and more hours are worked by other business partners (see section 6.1.3 below). The implication of this finding is that as farmers age, some of their work is transferred to younger partners in the business. On medium-sized and large farms, the average working hours of the principal farmer were shorter if the farm had a business partner.

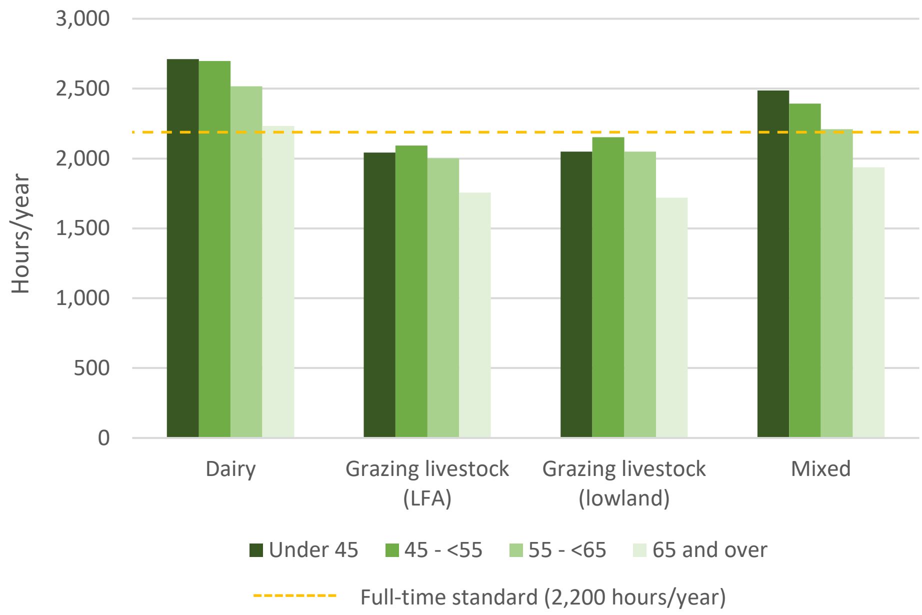


Figure 6.2. Average hours worked on the farm business by the principal farmer, 2018/19, England, by age
Data source: Farm Business Survey (RBR, 2021)
Data Builder variable used: 'Time worked by farmer on farm business (hours/year)'.

On average, principal farmers are working more hours than in the past, but only in certain farm sectors and size groups (Figure 6.3). In the dairy sector, the average principal farmer worked longer hours in 2018/19 than 1998/99 in every size group. Working hours have also increased in mixed farming, except on small mixed farms, where farmer input has decreased by 11%. However, the average principal farmer in the lowland and LFA sectors is working fewer hours than 20 years ago in all size groups except very large farms.

All four sectors recorded a strong increase (15–19%) since 1998/99 in hours worked by principal farmers on very large farms. Conversely, in the LFA, lowland and mixed sectors, small farms recorded large declines in farmer input and now have the lowest average working hours of all full-time farms. However, on small dairy farms the average labour-input from the principal farmer grew by 2% since 1998/99 and was actually higher in 2018/19 than on the average large and very large dairy farm.

The average age of principal farmers in the FBS has increased since 1998/99. Given that working hours tend to fall with age, ageing could be a factor in the fall in principal farmer input on some farms, especially in the LFA sector where the average age has risen the most.[8] However, the data are complex. During 2014/15–2018/19, the average hours worked by all principal farmers was stable or decreased slightly, consistent with the general decline in hours observed since 1998/99. However, this was mostly due to a decrease in hours worked by farmers *under* 55 years old.[9] In all four sectors, the average hours worked by farmers aged 65 or above actually increased between 2014/15 and 2018/19, though they still worked less than their younger counterparts.

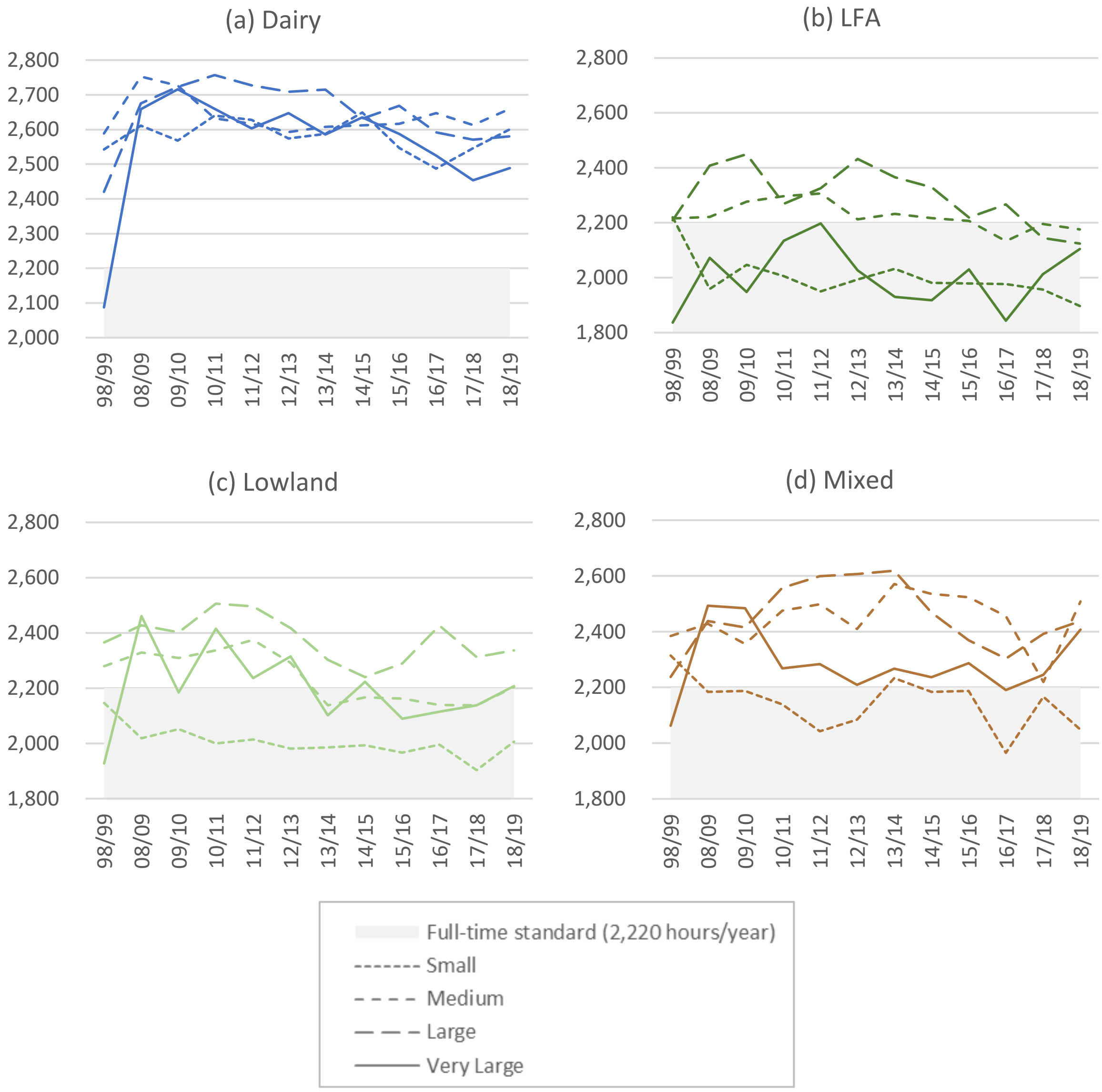


Figure 6.3. Hours per year worked by the principal farmer on full-time farms, by type and size, 1998/99 to 2018/19, England, average per farm

Data source: Farm Business Survey (RBR, 2021)

Farm size is measured by estimated Standard Labour Requirement. 'Full-time' excludes very small and part-time farms.
Data Builder variable used: 'Time worked by farmer on farm business (hours/year)'.

[8] The increases in average age by sector are: dairy, 12% increase (from 51 years old in 1998/99 to 57 in 2018/19); LFA, 16% increase (from 50 to 58); lowland, 11% increase (from 53 to 59); and mixed farming, 13% increase (52 to 59). These figures are the averages for full-time farms, excluding very small part-time farms.

[9] An exception is a 17% increase in working hours among farmers under 45 in the LFA sector.

6.1.2 Farmers' spouses

It has become more common over time for the spouse of a principal farmer to work on the farm business. In 2018/19, the FBS recorded a farmer's spouse working on 46% of dairy farms, 43% of lowland farms, 41% of LFA farms and 34% of mixed farms. In 1998/99, the equivalent percentages were 35% dairy, 21% lowland, 35% LFA and 27% mixed farming.

At the same time, however, the average amount of time that those spouses are working has decreased in all sectors except dairy. Between 1998/99 and 2018/19, the hours worked by the average spouse fell by 14% on full-time LFA farms to 675 hours/year and by 6% on full-time mixed farms to 755 hours/year. There is no figure for spousal hours on full-time lowland farm in 1998/99 but on all farms, including very small and part-time farms, the average hours worked fell by 8% over the same period. The hours increased by 7% on full-time dairy farms to an average 973 hours/year in 2018/19. These figures exclude farms in the FBS where no work was done by a spouse of the principal farmer; if such farms were included, the average hours per farm would obviously be much lower. The trend since 1998/99 is not smooth; in fact, spousal hours have picked up on LFA and lowland farms since a low point around 2008/9.

There is no evidence that farmers' spouses on the whole are working more than 2,200 hours/year and could be described as over-worked, although there is clearly variation among full-time farms of different types and sizes (see Table 6.1). However, compared with principal farmers, the average spouse spends much more time in off-farm employment, and it was not possible to combine the data to see the average total hours worked by spouses who work both on the farm business and in off-farm employment. Also, female spouses are likely to be spending additional time on family carework (Alston et al., 2017). We can only speculate that if farmers' spouses are over-worked, it is most likely to be occurring on farms where they work the most hours on the farm business, which in 2018/19 were large lowland farms (1,169), medium-sized (1,124) and large (1,123) dairy farms, and medium-sized mixed farms (1,007). These are all groups where principal farmers also recorded high average working hours. Spousal hours were typically lowest on small farms, as with principal farmers.

6.1.3 Business partners

Business partners are defined in the FBS as unpaid workers and are typically family members such as a son or daughter of the principal farmer, or the father or mother of the principal farmer following succession (Keith Robbins, personal communication, 11 February 2021). Excluding very small part-time operations, where business partners are rare, the percentages of farms with one or more business partners in 2018/19 were: 47% in dairy; 25% LFA; 33% lowland; and 47%

mixed farming. Among the full-time farms that did have business partners in 2018/19, the average number per farm was 1.2–1.3.

On average, a business partner works fewer hours in the farm business than the principal farmer, but more than the farmer's spouse (see Table 6.1). In 2018/19, there was evidence for over-employment among business partners on large dairy farms and very large lowland farms. In other groups, however, the average business partner worked less than 2,200 hours/year.

Similar to the situation with farmers' spouses, the average FBS farm has more business partners than 20 years ago but the hours that each individual business partner works tend to be less. Including only farms with at least one business partner, the average working hours of a business partner on full-time mixed farms in 1998/99 were 2,021 hours/year; 20% more than in 2018/19. The average also fell by 15% on full-time lowland farms, from 1,739 hours/year in 1998/99; and by 10% on full-time LFA farms, from 1,792 hours/year. When the time-series data are reviewed, they show that business partners' hours increased from 1998/9 until around 2008/9, and since then have fallen again. Only on full-time dairy farms were the average hours higher in 2018/19 (2,041 hours/year) than in 1998/99 (1,957 hours/year), a modest 4% rise.

6.1.4 Full-time and part-time paid workers

We would expect full-time workers to work around 2,200 hours/year. Only the full-time dairy sector averaged close to this in 2018/19 (2,181 hours). In the other sectors, the average full-time worker was estimated to have worked between 1,800 and 2,069 hours over the year (see Table 6.1). The only groups where the average exceeded the 2,200-hour threshold were medium-sized lowland farms (although note that the FBS data for this category of worker are incomplete).

The hours of part-time workers could vary greatly from worker to worker. The sector where part-time workers were estimated to have worked the most hours in 2018/19 is LFA farming, where the average hours for a part-time worker on a full-time farm were estimated at 1,005. This is a coefficient of the 2,200 FTE of 0.46 (see Chapter 3.3.4.1). In other sectors, the average part-time worker worked less than 1,005 hours/year, giving smaller FTE coefficients of 0.41 for dairy, 0.40 for mixed farming and 0.35 for lowland. Without knowing if the part-time workers had other forms of work, we cannot assess if they were in over-employment.

FBS Data Builder does not provide a complete time series for paid workers' hours, so it is difficult to review how they have changed over time. However, it is possible to compare 2018/19 with 2008/9, using the average calculated for all farms in the FBS, not just the farms which did employ full-time or part-time workers.[10] The data show a tendency for the hours of full-time staff to have

[10] The FBS Data Builder variable used is 'Average time worked by [full time][part time] workers (hours/year)', showing 'Average per farm' rather than 'Average of farms with'.

fallen in those 10 years, except in the lowland sector. In 2008/9, the hours worked by the average full-time worker on the average full-time dairy and mixed farm were above the 2,200 hours/year threshold (2,265 hours/year and 2,221 hours/year, respectively). However, by 2018/19 the average had dropped by 4% in dairy and by 7% in mixed farming, to below the threshold, with the exception of medium-sized dairy farms. The average also dropped in the LFA sector, from 1,954 hours/year in 2008/9 to 1,800 hours/year in 2018/19. In contrast, on the average full-time lowland farm the estimated hours of a paid full-time staff member increased by 5% from 1,887 hours/year in 2008/9 to 1,972 hours/year in 2018/19, although they are still under the 2,200 full-time threshold.

For part-time workers the data vary considerably by farm size, and there is less of a clear trend. In some farm groups the average part-time worker is working longer hours now than 10 years ago (e.g. medium-sized dairy farms, medium-sized LFA farms and very large mixed farms) , but in others they are working less (e.g. small mixed farms and most lowland farms).

6.2 The overall farm workforce

6.2.1 Labour-input

In the FBS, the estimates of each person's working hours are converted to AWU to produce a figure for the farm's total labour-input over the previous 12 months. It covers work by the principal farmer, their spouse, business partners and their spouses, unpaid workers, farm managers, paid full-time, part-time and casual workers, and trainees. It does not include work done by agricultural contractors. This makes it possible to assess how the overall capacity of farm workforces (in labour-input) has changed over time.[11]

In 2018/19, paid labour was recorded on 94% of full-time dairy farms, 84% of mixed farms, 67% of LFA farms and 57% of lowland farms. These percentages indicate differences in labour usage between farm types. Another factor related to the use of paid labour is farm size. Data for some size categories are missing, but in general the FBS indicates that the larger the farm businesses in terms of Standard Output, the more likely it is to use paid labour.

In particular, full-time paid workers are concentrated in the higher-output bracket. Large and very large farms by Standard Output were much more likely than the average farm to have full-time paid workers in 2018/19. For example, in mixed farming, full-time staff were reported by 21% of the small farms but 74% of the very large farms. Size appears to make less of a difference

[11] AWU should be directly proportional to hours worked, since 1 AWU = 2,200 hours. However, in FBS Data Builder, the AWU of principal farmers is capped at 1.0, even if the farmer worked more than 2,200 hours during the year. For the present analysis, the unadjusted figure was used to allow for the farmer AWU to be greater than 1.0 and thus capture more accurately the time worked.

when it comes to the employment of part-time workers. Even so, a similar correlation with Standard Output is visible. For example, in 2018/19, 11% of small LFA farms recorded part-time workers, compared with 43% of very large LFA farms.

The use of casual labour was fairly widespread throughout livestock farming in 2018/19, and casual workers were more likely to be found on smaller farms than either part-time or full-time salaried workers. Again, as farm businesses get larger the percentage with casual workers increases, although the growth is flatter than with full-time and part-time workers; in the dairy sector, there is little difference between medium-sized (67%), large (58%) and very large (70%) farms in the percentages that used paid casual labour.

Decline

The data show a loss of labour-input from within the workforce on the average LFA, lowland and mixed farm over the past 20 years. A summary is depicted in Figure 6.4 (note that unlike in Figure 6.1 above, the chart shows results for *all farm sizes*, including the very small and part-time farms, since the ‘full-time’ category is missing some data for some of the smaller worker categories in Data Builder, but the discussion in the text will focus on *full-time farms*). The greatest decline occurred in mixed farming (-20% AWU on the average full-time farm). Since 1998/99 the average full-time mixed farm workforce has lost the equivalent of one part-time worker in labour-input, and now contains the equivalent of two full-time people and one further nearly full-time or part-time person (2.82 AWU). The LFA (-9%) and lowland (-1%) grazing sectors recorded smaller declines, although of the LFA farms, substantial falls in labour-input on suckler beef and mixed livestock farms were counteracted by an increase in labour-input on specialist sheep farms in Severely Disadvantaged Areas. In 2018/19, the average full-time LFA or lowland grazing farm used fewer than two full-time people in labour-input (1.8 AWU). In comparison, the increase in dairy labour-input since 1998/99 (37%) is striking. Between 1998/99 and 2018/19, the average full-time dairy farm gained the equivalent of one full-time worker and one part-time worker in labour-input, taking the total to 4.3 AWU.

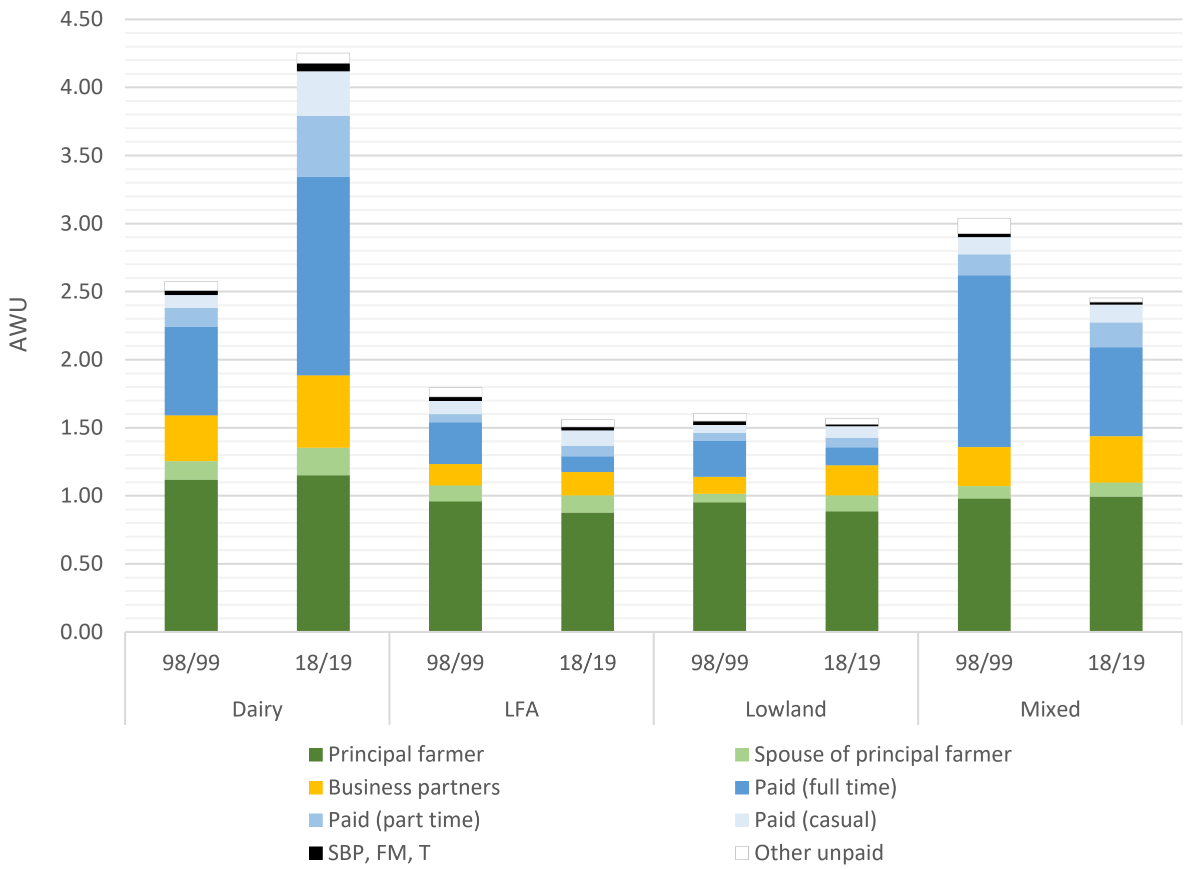


Figure 6.4. Breakdown of the workforce on the average farm, 1998/99 and 2018/19, England, based on annual labour-input (AWU) of all workers
Data source: Farm Business Survey (RBR, 2021)

FM, T, SBP = farm manager, trainees and spouses of business partners
Shows all farms in the FBS, including very small and part-time farms, since some data are missing for the 'full-time' sub-category.
Data Builder variables used: 'AWU of [spouses of principal farmers][business partners (other than farmer)][paid workers – full time][paid workers – part time][paid casual workers][spouses of business partners (not farmer)][farm manager][trainees][unpaid workers other than farmers/partners & spouse]'. AWU of principal farmers is calculated from their annual hours, using the variable 'Time worked by farmer on farm business (hours/year)', rather than being capped at 1.0. The average is 'Average per farm'.

Detailed figures are given in Table 6.2. They show that the increased average AWU in the dairy sector since 1998/99 came from growth on large and very large farms (as measured in SLR); the average small and medium dairy farm actually recorded a decline in labour-input. Aside from the largest dairy farms, the only other size groups that recorded an increase in average total AWU since 1998/99 are very large LFA farms and small lowland farms. The declines in total AWU elsewhere have been largest on large and very large lowland farms and large mixed farms.

Table 6.2. Change in average workforce on full-time farms as measured in labour-input (AWU), England, by farm type and size, 1998/99 to 2018/19

Data source: Farm Business Survey (RBR, 2021)

		Average labour input/farm (AWU)														
		1998/99					2018/19					% change since 1998/99				
Farm type	**Labour source**	**All FT**	**S**	**M**	**L**	**VL**	**All FT**	**S**	**M**	**L**	**VL**	**All FT**	**S**	**M**	**L**	**VL**
Dairy	Principal farmer	1.13	1.16	1.18	1.10	0.95	1.16	1.18	1.21	1.17	1.13	2%	2%	3%	6%	16%
	Spouse of principal farmer	0.14	0.18	0.14	0.11	0.06	0.21	0.13	0.27	0.27	0.16	43%	-36%	46%	59%	60%
	Business partners	0.36	0.22	0.36	0.53	0.62	0.54	/	0.33	0.62	0.60	48%	/	-8%	15%	-4%
	Paid (full time)	0.71	0.15	0.75	1.12	2.32	1.48	/	0.38	0.73	2.37	108%	/	-97%	-54%	2%
	Paid (part time)	0.14	0.07	0.10	0.28	/	0.45	/	0.26	0.33	0.62	226%	/	63%	14%	/
	Paid (casual)	0.10	0.05	0.11	0.15	0.20	0.33	0.03	0.13	0.17	0.52	217%	-99%	12%	8%	62%
	SBP, FM, T	0.04	0.02	0.02	0.02	/	0.06	0.00	0.00	0.04	/	61%	/	/	52%	/
	Other unpaid	0.06	0.04	0.06	0.04	0.30	0.08	/	/	0.12	/	22%	/	/	64%	/
	Total labour input	**2.69**	**1.89**	**2.72**	**3.35**	**4.91**	**4.30**	**1.66**	**2.63**	**3.44**	**5.55**	**59%**	**-14%**	**-4%**	**3%**	**11%**
LFA	Principal farmer	0.99	1.01	1.01	1.00	0.83	0.92	0.86	0.99	0.97	0.96	-7%	-17%	-2%	-4%	13%
	Spouse of principal farmer	0.13	0.14	0.13	0.11	0.16	0.15	0.10	0.18	0.23	0.20	14%	-45%	25%	55%	18%
	Business partners	0.18	0.08	0.20	0.19	0.47	0.22	0.09	0.22	0.29	0.65	22%	12%	10%	33%	28%
	Paid (full time)	/	0.11	0.14	0.45	1.56	0.16	/	/	0.16	0.94	/	/	/	-188%	-67%
	Paid (part time)	/	/	0.10	0.09	0.15	0.10	/	0.13	0.08	0.36	/	/	22%	-11%	59%
	Paid (casual)	0.11	0.05	0.08	0.14	0.36	0.15	0.06	0.09	0.19	0.61	34%	14%	17%	26%	41%
	SBP, FM, T	/	/	/	0.05	/	0.03	0.00	0.00	/	/	/	/	/	/	/
	Other unpaid	/	/	/	0.10	/	0.06	0.06	0.09	/	/	/	/	/	/	/
	Total labour input	**1.96**	**1.45**	**1.78**	**2.14**	**3.78**	**1.79**	**1.24**	**1.74**	**2.02**	**3.92**	**-8%**	**-17%**	**-2%**	**-6%**	**3%**
Lowland	Principal farmer	1.00	0.98	1.04	1.08	0.88	0.96	0.91	1.00	1.06	1.00	-4%	-7%	-3%	-1%	13%
	Spouse of principal farmer	0.09	0.06	0.11	0.22	/	0.15	0.14	0.14	0.21	0.19	70%	55%	23%	-5%	/
	Business partners	/	0.13	0.20	0.46	/	0.26	0.22	0.26	0.30	0.45	/	43%	21%	-54%	/
	Paid (full time)	0.33	0.12	0.26	/	/	0.19	/	0.09	0.25	0.78	-44%	/	-186%	/	/
	Paid (part time)	0.08	0.05	/	/	/	0.09	0.07	0.08	0.14	0.28	19%	23%	/	/	/
	Paid (casual)	0.06	0.04	0.06	0.16	0.18	0.11	0.08	0.08	0.14	0.39	69%	49%	24%	-16%	53%
	SBP, FM, T	/	/	/	/	/	0.02	/	0.01	0.01	0.00	/	/	/	/	/
	Other unpaid	/	/	0.17	/	/	0.06	0.03	0.16	0.00	/	/	/	-5%	/	/
	Total labour input	**1.85**	**1.45**	**1.96**	**3.05**	**3.97**	**1.83**	**1.59**	**1.82**	**2.11**	**3.19**	**-1%**	**9%**	**-7%**	**-44%**	**-24%**
Mixed	Principal farmer	1.02	1.05	1.08	1.02	0.94	1.04	0.93	1.14	1.11	1.09	2%	-13%	5%	8%	14%
	Spouse of principal farmer	0.10	0.13	0.04	0.10	0.10	0.12	0.08	0.15	0.21	0.12	24%	-69%	72%	52%	12%
	Business partners	0.31	0.20	0.29	0.35	0.41	0.44	0.33	0.44	0.34	0.75	42%	39%	33%	-4%	45%
	Paid (full time)	1.48	0.30	0.62	1.50	3.86	0.78	0.23	0.28	0.68	2.54	-47%	-28%	-123%	-123%	-52%
	Paid (part time)	/	0.05	/	0.31	0.27	0.22	0.12	0.20	0.18	0.49	/	60%	/	-76%	45%
	Paid (casual)	0.14	0.05	0.09	0.13	0.32	0.16	/	0.09	0.20	0.35	16%	/	-1%	38%	8%
	SBP, FM, T	/	0.00	0.00	0.02	0.08	0.02	/	/	/	/	/	/	/	/	/
	Other unpaid	/	0.13	0.19	0.08	0.14	0.04	/	/	/	/	/	/	/	/	/
	Total labour input	**3.38**	**1.92**	**2.41**	**3.52**	**6.13**	**2.82**	**1.82**	**2.30**	**2.80**	**5.47**	**-17%**	**-5%**	**-5%**	**-26%**	**-12%**

AWU = Annual Work Unit, equivalent to 2,200 hours/year. FT = full-time, S = small, M = medium, L = large, VL = very large. FM, T, SBP = farm manager, trainees and spouses of business partners.
Farm size is measured by estimated Standard Labour Requirement. 'Full-time' excludes very small and part-time farms.
Data Builder variables used: 'AWU of [spouses of principal farmers][business partners (other than farmer)][paid workers – full time][paid workers – part time][paid casual workers][spouses of business partners (not farmer)][farm manager][trainees][unpaid workers other than farmers/partners & spouse]'. AWU of principal farmers is calculated from their annual hours, using the variable 'Time worked by farmer on farm business (hours/year)', rather than being capped at 1.0. The average is 'Average per farm'. Cells are empty when data are not available from Data Builder.

Retrenchment to the family?

For some worker types such as spouses and business partners, their average AWU per farm has increased even though the hours worked by an average individual have fallen (as noted above), since they are more common in farm workforces than previously. Nevertheless, total AWU has declined because the increased labour-input from business partners, spouses and casual and/or part-time workers on some farm has been outweighed by a reduced labour-input from full-time paid workers. In 2018/19, paid labour was recorded on 94% of full-time dairy farms, 84% of mixed farms, 67% of LFA farms and 57% of lowland farms. These percentages are lower than they were in 1998/99 in all four livestock sectors except dairy; that is, proportionally fewer livestock farms have paid workers now than they did 20 years ago. This is made clear in Figure 6.5, a simplified version of Figure 6.4 above. In the lowland and LFA sectors, the fall in working hours by principal farmers is an additional factor in the decline in AWU.

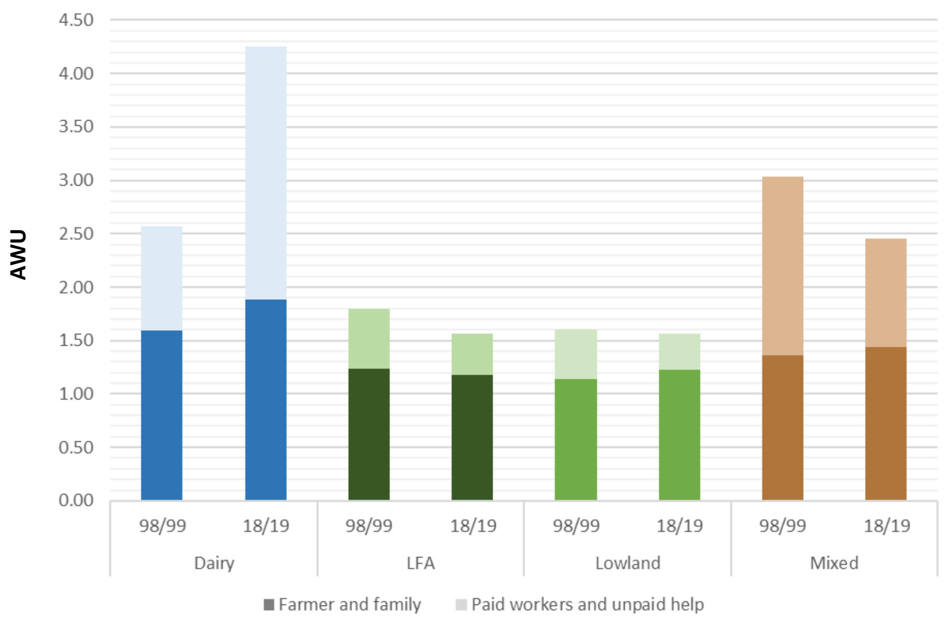


Figure 6.5. Simplified breakdown of the workforce on the average farm, 1998/99 and 2018/19, England, based on annual labour-input (AWU) of all workers
Data source: Farm Business Survey (RBR, 2021)

Since full-time paid labour has decreased so much outside the dairy sector, the core workforce of principal farmer, spouse and business partners now provides proportionally more work on the average farm business than 20 years ago (Figure 6.6 and Table 6.3). These three labour sources now account for 75% of total labour-input on the average LFA farm (all sizes), compared with 69% in 1998/99; 78% on the average lowland farm (71% in 1998/99); and 59% on the average mixed farm (45% in 1998/99). In contrast, the core workforce accounted for only 44% of total labour-input on the average dairy farm in 2018/19, a drop from 69% in 1998/99.

(It is important to note that family members can be categorised as paid workers in the FBS, so the unpaid family–paid non-family distinction is not clear-cut.)

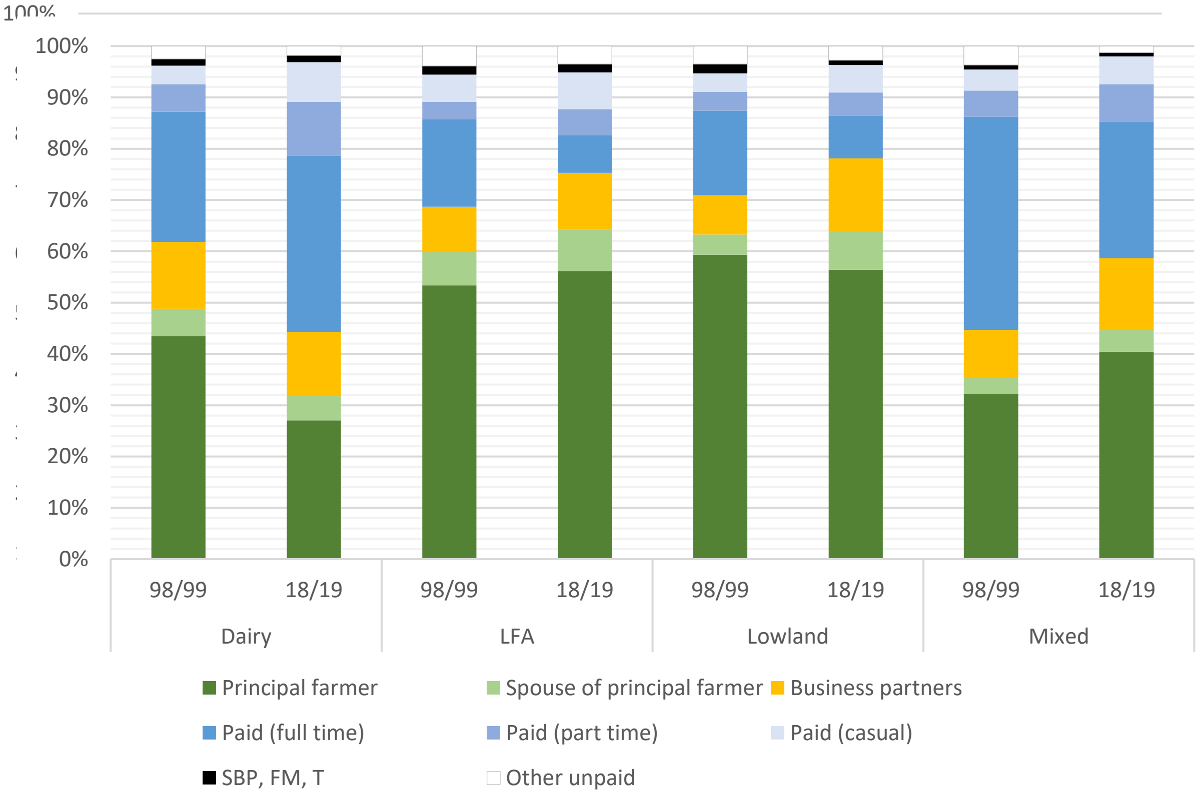


Figure 6.6. Change in composition of workforce on the average farm between 1998/99 and 2018/19, England, based on annual labour-input (AWU) of all workers
Data source: Farm Business Survey (RBR, 2021)

FM, T, SBP = farm manager, trainees and spouses of business partners
Shows all farms in the FBS, including very small and part-time farms, since some data are missing for the 'full-time' sub-category.
Data Builder variables used: 'AWU of [farmers][spouses of principal farmers][business partners (other than farmer)][paid workers – full time][paid workers – part time][paid casual workers][spouses of business partners (not farmer)][farm manager][trainees][unpaid workers other than farmers/partners & spouse]'. The average is 'Average per farm'.

Table 6.3. Contribution of different labour types to average farm workforce in 1998/99 and 2018/19, England, based on annual labour-input (AWU) of all workers
Data source: Farm Business Survey (RBR, 2021)

	Dairy		LFA		Lowland		Mixed	
	98/99	18/19	98/99	18/19	98/99	18/19	98/99	18/19
Principal farmer	43%	27%	53%	56%	59%	56%	32%	40%
Spouse of principal farmer	5%	5%	7%	8%	4%	8%	3%	4%
Business partners	13%	12%	9%	11%	8%	14%	9%	14%
Paid (full time)	25%	34%	17%	7%	16%	8%	41%	27%
Paid (part time)	5%	11%	3%	5%	4%	5%	5%	7%
Paid (casual)	4%	8%	5%	7%	4%	5%	4%	5%
SBP, FM, T	1%	1%	2%	2%	2%	1%	1%	1%
Other unpaid	3%	2%	4%	3%	3%	3%	4%	1%

FM, T, SBP = farm manager, trainees and spouses of business partners
Other notes as for Figure 6.6.

It was mentioned above that proportionally fewer livestock farms have paid workers now than they did 20 years ago. Aside from farm type, another factor that is related to the use of paid labour is farm size. Data for some size categories are missing, but in general the FBS indicates that the larger the farm businesses in terms of SLR, the more likely it is to use paid labour.

Today, full-time paid workers are concentrated in the high-output bracket. Large and very large farms by SLR were much more likely than the average farm to have full-time paid workers in 2018/19. For example, in mixed farming, full-time staff were reported by 21% of the small farms but 74% of the very large farms. Size appears to make less of a difference when it comes to the employment of part-time workers. Even so, a similar correlation with SLR is visible. For example, in 2018/19, 11% of small LFA farms recorded part-time workers, compared with 43% of very large LFA farms.

As discussed, the use of casual labour is fairly widespread in today's livestock farming, and casual workers were more likely to be found on smaller farms than either part-time or full-time salaried workers in 2018/19. Again, as farm businesses get larger the percentage with casual workers increases, although the growth is flatter than with full-time and part-time workers; in the dairy sector, there is little difference between medium-sized (67%), large (58%) and very large (70%) farms in the percentages that used paid casual labour.

6.2.2 Number of people

While average total labour-input (AWU) has fallen since 1998/99 in each sector except dairy, the average number of people in the farm workforce has increased across the board. The average farm workforce now has more people working fewer hours.

This is partly because more farms have a spouse or business partner working on the farm than in the past. It is also because there are more part-time or casual workers in place of single full-time workers (Figure 6.7). Dairy is the only sector that has recorded a substantial increase in average labour-input per farm from full-time paid workers since 1998/99 (note the blue line in Figure 6.7). Following this, the average number of workers and overall labour-input per farm have also increased strongly. The other sectors recorded a decline in labour-input from full-time paid workers, and their total labour-inputs per farm have decreased. However, because they recorded a small uptick in labour-input from part-time and/or casual paid workers, we see a small increase in the average number of workers per farm.

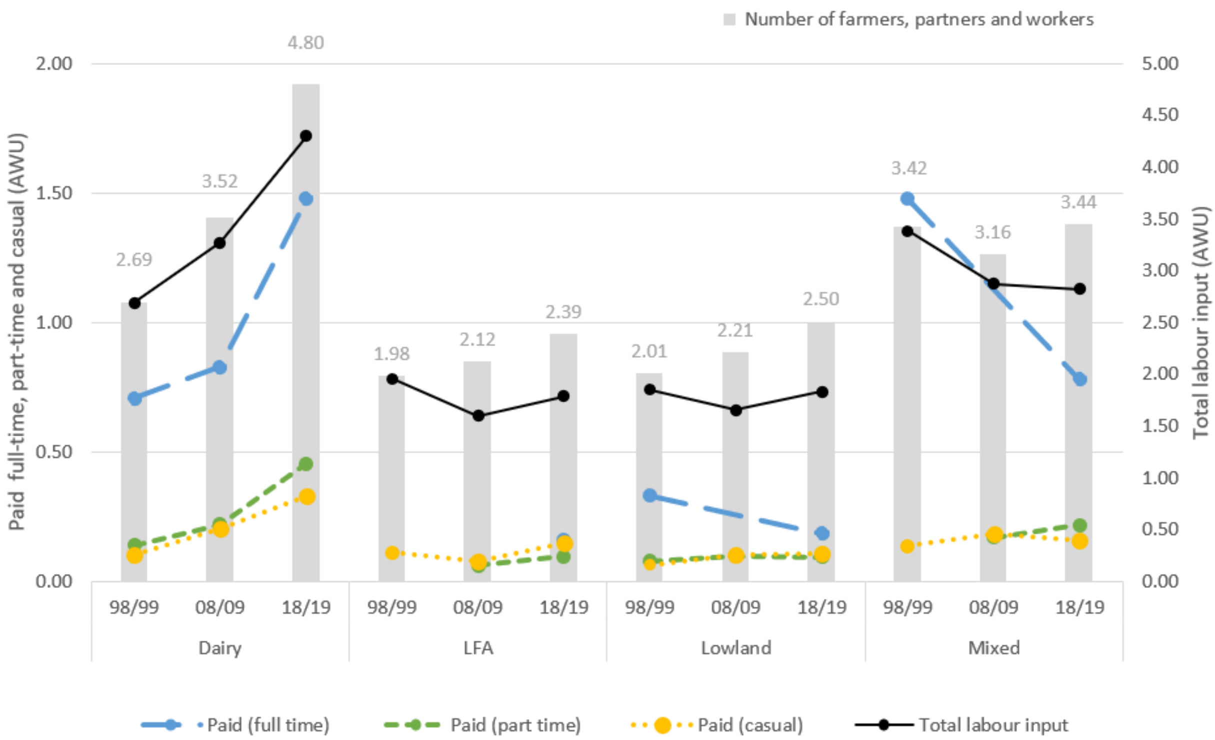


Figure 6.7. Average number of farmers, partners and workers per full-time farm, against average labour-input from paid labour sources and total labour-input per farm, 1998/99–2018/19, England
Data source: Farm Business Survey (RBR, 2021)

Farm size is measured by estimated Standard Labour Requirement. 'Full-time' excludes very small and part-time farms.
Paid labour sources exclude farm managers and trainees.
Data Builder variables used: 'Number of farmers, partners and workers', 'AWU of [paid workers – full time][paid workers – part time][paid casual workers]' and 'Labour input (full-time equivalents or AWU)'. The average is 'Average per farm'.

By size, the farms that had the most people in the workforce in 2018/19 are very large dairy farms (average 6.17 people/farm), very large mixed farms (6.04), very large LFA farms (4.41) and very large lowland farms (3.92). In dairy, very large farms have recorded the greatest increase in the average number of workers, from 4.95 in 1998/99 to 6.17 in 2018/19. But in the other sectors, numbers have increased most since 1998/99 among small full-time farms. In mixed and lowland farming, the average number of workers per farm fell on large and very large farms.

6.2.3 Contributing factors to changes in farm workforces

The FBS data support long-standing observations in the literature that casualisation of paid labour has contributed to the decline in input from full-time workers in agriculture (Errington, 1988). The analysis also suggests some other reasons why labour-input might have fallen on many livestock farms in the FBS over the past few years: labour savings and unaffordability.

6.2.3.1 Labour savings

Use of contractors

It is possible that some farms have reduced their labour-input by continuing to outsource more work to agricultural contractors (Nye, 2018). Use of agricultural contractors with machinery was already very high in 2001/2 (the oldest year for which FBS data are available), and by 2018/19 it had grown even more to become near universal (see Table 6.4). Even on very large LFA farms, which had lagged behind the others, the use of contractors grew by 19% to cover 97% of them in 2018/19. There were also marked increases in that period in how much farms spend annually on contractors, ranging from 59% on the average large mixed farm to 245% on the average very large LFA farm. Contractor fees are likely to have increased over that period to cover rises in diesel fuel prices, more expensive machinery being used and general inflation. Also, as the average farm size has increased (Figure 6.9), we might expect contractor expenditure to have increased too. Nevertheless, the very large percentage growth indicates that at least part of the increase in expenditure is due to farms using contractors more than in the past. (Figure 6.8 shows that contractor expenditure on the average farm was higher in 2018/19 than 2001/2 (except on very large lowland farms), which coincided with the trend of rising labour-input from casual workers between 1998/99 and 2018/19 and the fall in full-time workers and overall workforces.

Table 6.4. Percentage of farms that used contractors and average expenditure on contractors per farm in 2001/2 and 2018/19, England, by farm type and farm size
Data source: Farm Business Survey (RBR, 2021)

		Percentage of farms			Average expenditure per farm (£)		
		01/02	**18/19**	**% change**	**01/02**	**18/19**	**% change**
Dairy	Small	99%	100%	1%	3,370	5,425	61%
	Medium	99%	97%	-1%	6,857	11,262	64%
	Large	99%	98%	-1%	10,169	19,188	89%
	Very large	100%	99%	-1%	22,109	44,334	101%
LFA	Small	88%	95%	9%	1,288	2,912	126%
	Medium	92%	95%	3%	2,169	3,693	70%
	Large	99%	100%	1%	3,279	7,329	123%
	Very large	81%	97%	19%	3,595	12,404	245%
Lowland	Small	92%	98%	6%	2,538	5,714	125%
	Medium	92%	94%	2%	2,219	6,207	180%
	Large	95%	98%	3%	5,439	10,698	97%
	Very large	100%	100%	0%	15,886	14,419	-9%
Mixed	Small	99%	100%	1%	3,086	7,276	136%
	Medium	92%	97%	6%	5,386	9,358	74%
	Large	97%	94%	-3%	8,757	13,927	59%
	Very large	98%	100%	2%	15,706	47,093	200%

Farm size is measured by estimated Standard Labour Requirement.
Data Builder variables used: ‘Contract costs for agriculture: [Average per farm][% of farms with]’.

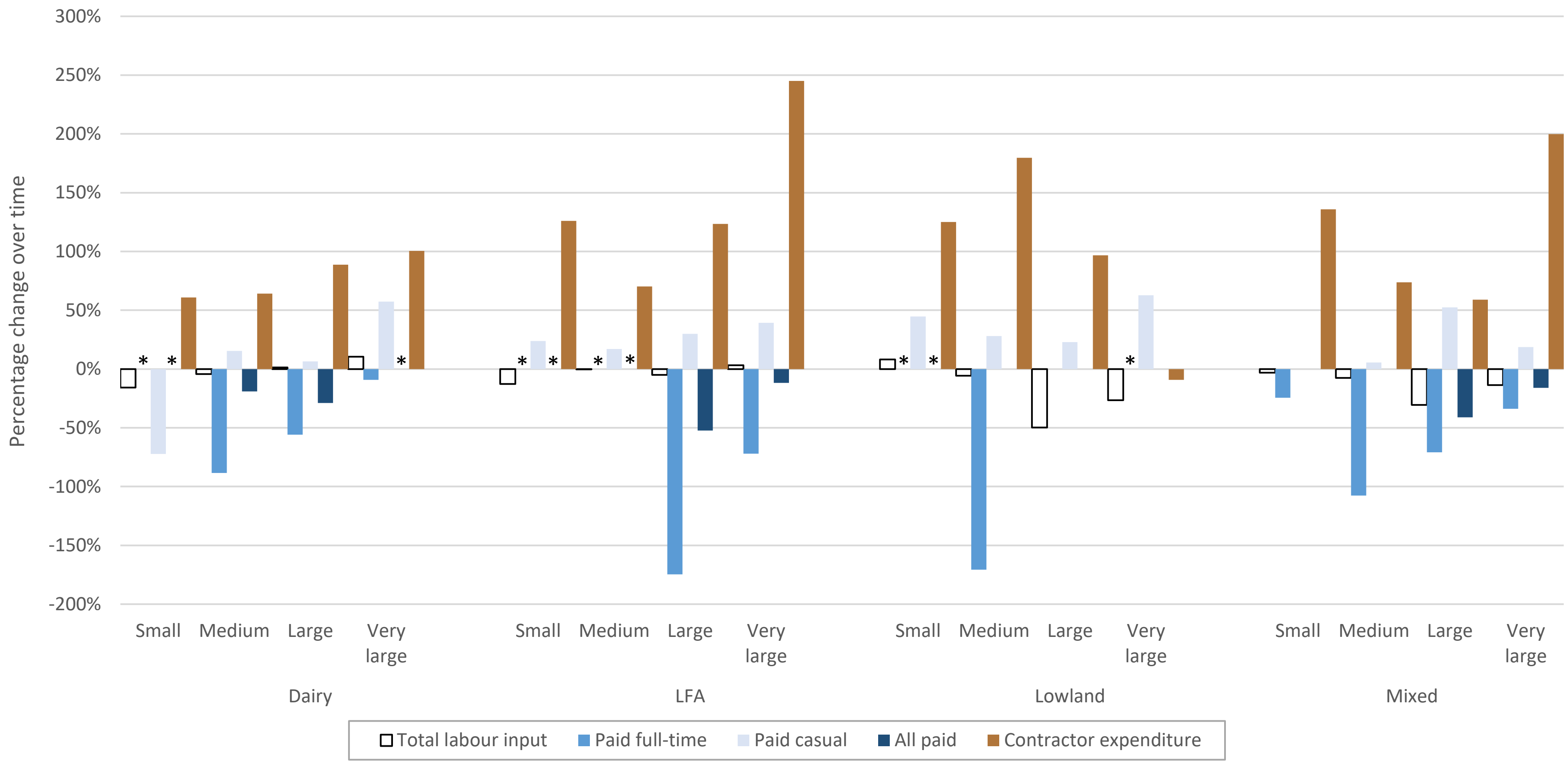


Figure 6.8. Percentage change in (a) average labour-input (AWU) from various labour sources per farm between 1998/99 and 2018/19; and (b) average expenditure (£) on agricultural contractors per farm between 2001/2 and 2018/9, by farm type and size. Data source: Farm Business Survey (RBR, 2021)

* = data missing. Farm size is measured by estimated Standard Labour Requirement.

Data Builder variables used: 'Labour input (full-time equivalents or AWU)', 'AWU of [paid workers – full-time][paid workers – part time][paid workers]' and 'Contract costs for agriculture'.

Labour efficiencies

The FBS data suggest that the labour intensity of some livestock farming systems has fallen in the past 20 years, affecting their demand for workers and contributing to the reduction in average labour-input.

Some have probably achieved labour economies of scale, since the average farm area has increased in all sectors since 1998/99 and some sectors have seen a fall in the number of farms and/or a reduction in herd or flock size (Figure 6.9). On LFA farms, although cattle and sheep numbers have picked up since 2008/9 they had both been falling since 1998/99 and a recent upswing in average area has outpaced livestock numbers, which is perhaps attributable to de-stocking or other agri-environment measures on upland farms (Mansfield & Peck, 2013). The data show the sector has undergone consolidation, as the average cattle and sheep numbers did rise in the 'very large' category, while falling in the smaller size categories. The estimated SLR of the average very large LFA grazing livestock farm has increased accordingly, but fallen on the smaller farms. In mixed farming, the average farm's estimated SLR is lower than it was in 1998/99 and the average number of cattle has fallen across the board, although the average sheep flock has increased on very large mixed farms.

Consolidation has also occurred in the dairy sector, with fewer farms than in 1998/99 and an increase in the average area and herd per farm. Dairy farms have become more specialised, with fewer sheep, and where they may differ from LFA and mixed farms is that their production systems have intensified and the estimated SLR of the average full-time dairy farm has increased accordingly. Therefore, if the data show an increase in labour-input or contractor costs per dairy farm, it could simply be because the average farm business is larger and so too is the workload.

Labour–technology substitution

Average farm expenditure on machinery and equipment has increased in all sectors since 1998/99. The FBS shows that running costs, the value of technological assets and capital expenditure on buildings and improvements were all higher in 2018/19. Probably, some farms in the dairy and beef finishing sectors have increased their spending as part of the process of running more technologically intensive production systems with larger herds on larger units (Clay et al., 2019). Their labour-input might remain high, since such systems are also labour-intensive. On other farms where labour-input has fallen, the data could suggest that a degree of labour–technology substitution has occurred, whereby some of the labour has been replaced or made more efficient by machinery or equipment.

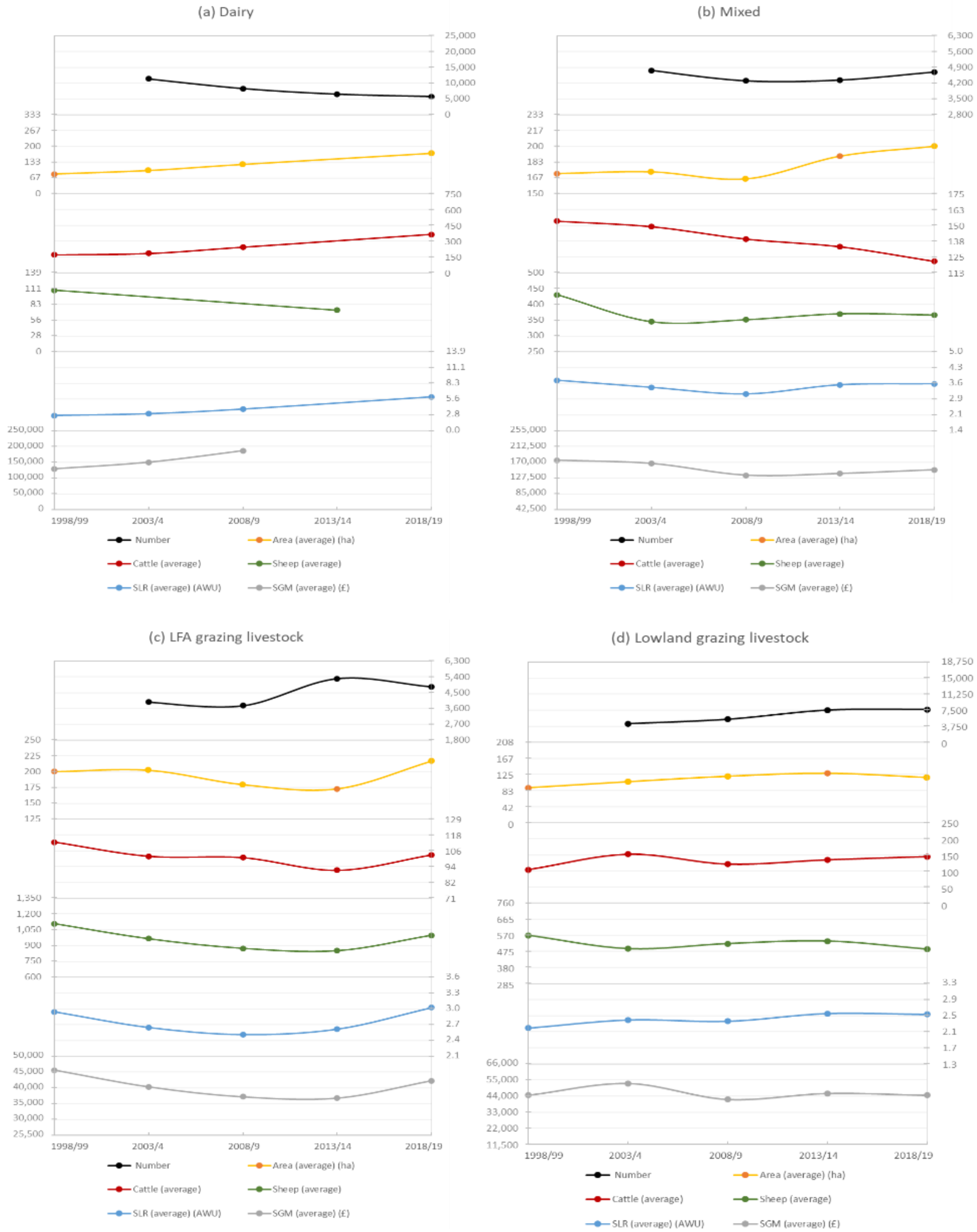


Figure 6.9. Changes in characteristics of the average full-time livestock farm, 1998/99–2018/19, England

Farm Business Survey (RBR, 2021)

SGM = Standard Gross Margin.

Farm size is measured by estimated Standard Labour Requirement. 'Full-time' excludes very small and part-time farms.

Data Builder variables used: 'Number of farms', 'Total area of farm', 'Cattle – average number over year', 'Sheep – average number over year', 'Standard Labour Requirement (SLR)' and 'Standard Gross Margin (SGM in £)'. The average is 'Average per farm'.

Scale ranges for characteristics are proportional to each other in each chart, but not between charts. Dairy data are missing for some years.

6.2.3.2 Unaffordability of paid labour

Given the financial pressures on livestock farming in England (Winter & Lobley, 2016), it seems likely that an increasing inability to afford paid labour is a factor in the decline in average labour-input on many farms. The FBS shows that in all four sectors, the costs of farming – not including labour costs – have increased at a greater rate than output since 2000/1 (the oldest year for which data are available). The dairy sector recorded the highest increase in output since 2000/1, but also experienced the highest rate of growth in costs. In 2018/19, the average full-time dairy farm recorded £568,753 in agricultural output (up 313% from 2000/1) and £624,454 in total business output (up 319%), but livestock costs were up 393% and machinery costs up 621%. It was not possible to conduct a full balance sheet analysis, but it appears that the farms that have been squeezed the most over the last few years are small farms in the dairy and mixed sectors, and medium-sized farms in the LFA and lowland sectors.

The findings imply that many farms have less money available to pay for labour than they used to. Indeed, there has been a decrease in the input from paid labour since 1998/99 both in absolute terms and as a proportion of the workforce in all sectors except dairy. Perhaps having access to foreign workers allowed the very large dairy farms to expand their paid workforces despite cost pressures (RABDF, 2017).

One indication that farm labour systems may be under-resourced is that average labour-input has fallen below the estimate of labour required – that is, the average farm's AWU is now much lower than its theoretical SLR (Figure 6.10). On the average full-time dairy farm, total AWU was 100% of SLR in 1998/99, but only 72% in 2018/19. The other sectors were already operating below theoretical SLR in 1998/99, especially in the LFA sector, but in the past 20 years this has fallen further: LFA, from 67% to 59%; lowland, 85% to 72%; and mixed, 91% to 79%. Alternative explanations for the decline in AWU relative to SLR include: increased labour outsourcing to contractors; improvements in labour productivity; diversification into less labour-intensive on-farm enterprises; or outdated assumptions used to estimate SLR (see GOV.UK, 2014b).

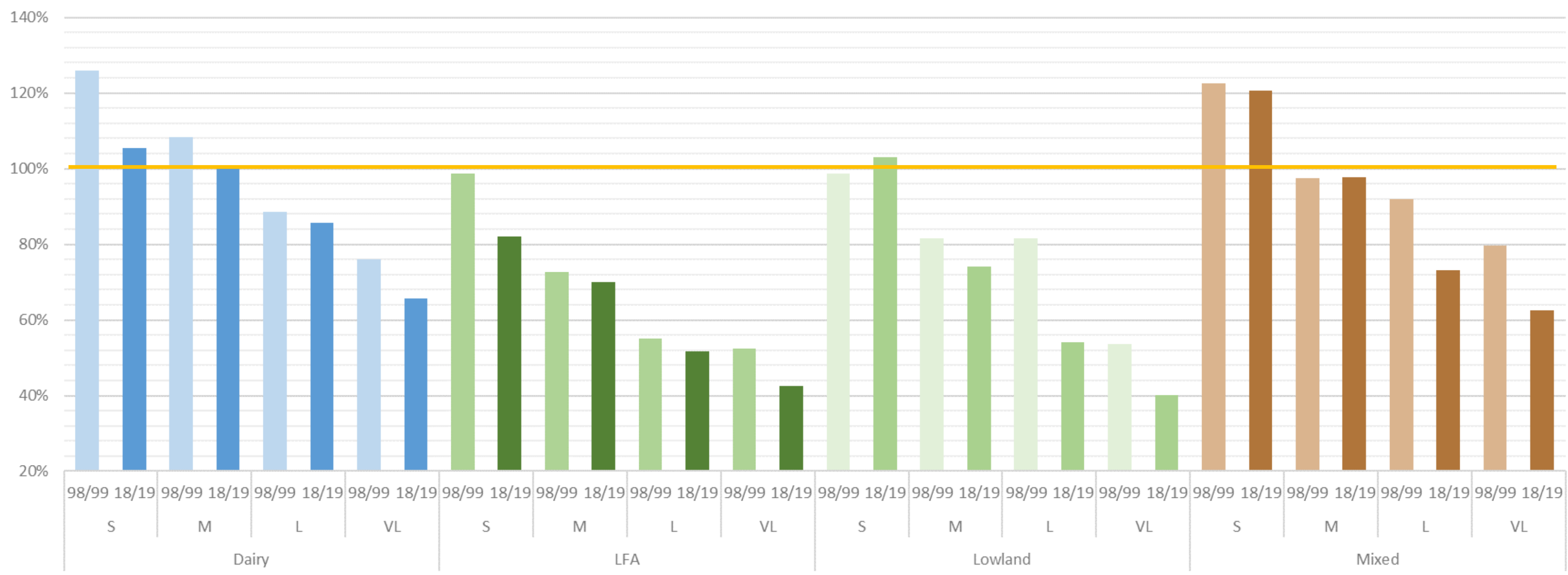


Figure 6.10. AWU as percentage of SLR, average per full-time farm, England, 1998/99 and 2018/19
Data source: Farm Business Survey (RBR, 2021)

S = small, M = medium, L = large, VL = very large. Farm size is measured by estimated Standard Labour Requirement. 'Full-time' excludes very small and part-time farms.
Data Builder variables used: 'Standard Labour Requirement (SLR)' and 'Labour input (full-time equivalents or AWU)'. The average is 'Average per farm'.

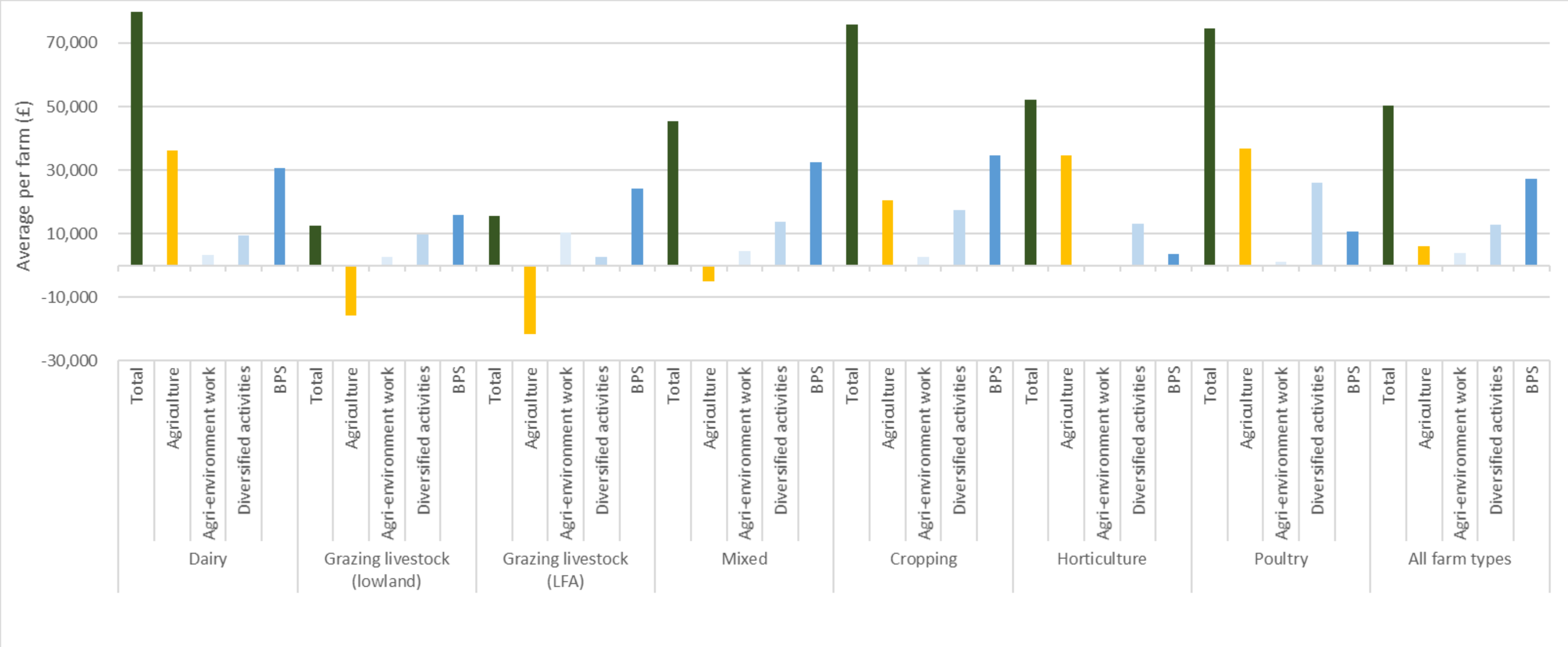


Figure 6.11. Total farm business income and breakdown by income source of different farm types in England, 2018/19

Data source: Farm Business Survey (RBR, 2021)

BPS = Basic Payment Scheme.

Data Builder variables used: 'Farm business income (main farm income measure)' and 'Income from [agriculture (including subsidies and grants to agriculture)][agri-environment work][diversified activities][Basic Payment scheme]'. The average is 'Average per farm'.

Specialist pig farms are not included because average farm business income was unavailable.

This leads to a question: could a financially motivated reduction in paid labour-input lead to overwork among the unpaid workforce? On this the data are mixed.

- On farms without paid labour, the principal farmer tends to work slightly fewer, rather than more, hours than average. Indeed, when farms with a similar SLR are grouped by the amount of paid labour that they used, the average hours worked by the principal farmer in 2018/19 were highest when they employed a small amount of paid labour. The average hours worked by the principal farmer only begin to fall when larger amounts of paid labour equivalent to >1.0 AWU were used. Thus, principal farmers do not appear to work longer hours when they do not use paid labour.
- However, it is generally observed that principal farmers on medium-sized farms work slightly longer hours than their counterparts on large and very large farms. Medium-sized farms also tend to have smaller workforces than larger farms do. This might suggest that as farms get larger, some of the work is taken over by paid workers, thereby removing some of the labour pressure on principal farmers. It is also possible that some compensatory labour is provided by business partners, since their average working hours in 2018/19 were longest on farms with either no paid labour or large amounts of paid labour. On medium-sized LFA and lowland farms, which seemed badly affected by the cost–price squeeze, the hours worked by principal farmers have slightly fallen rather than increased since 1998/99, but the input from (multiple) business partners has grown and could possibly have offset some of the losses from paid labour during the period.
- On medium-sized mixed farms, principal farmers now work the longest hours of all livestock farms outside dairy and, together with increased input from spouses and business partners on these farms, this could indicate the family workforce working more to compensate for a fall in paid labour. This could also apply to some large and very large farms, such as large dairy, large LFA and very large mixed farms.

6.3 Summary

The analysis of English FBS data has generated some findings relevant to Research Question 1 on the changing nature of labour systems and employment patterns in UK livestock farming. In general, the composition of FBS farm workforces in 2018/19 looks different from the average workforce in 1998/99, although the picture is mixed, with considerable variation depending on the size and type of farm.

While some data are unavailable, in general it appears that in the LFA, lowland and mixed farming sectors, there has been a reduction over time in labour-input from paid full-time workers, and an increase in labour-input from part-time or casual staff, tending to result in a net decrease in total workforce capacity. Expenditure on agricultural contractors has also increased. The change in labour-input is particularly marked in mixed farming. Here, the average AWU fell from 3.38/farm in 1998/99 to 2.82/farm in 2018/19, with a 47% decline in full-time paid labour-input and a 17% decline in labour-input overall.

Especially on upland and lowland cattle and sheep farms, there has been some retrenchment to the core family workforce. The proportion of farms in the LFA, lowland and mixed farming sectors that use no paid workers at all was larger in 2018/19 than it was 20 years previously.

Employment trends in the dairy sector are somewhat different. Here, the average farm has also increased its use of part-time and casual workers, but full-time paid labour increased too, albeit at a lower rate and only on the largest farms. Rather than shrink, the average dairy farm workforce is 59% larger in terms of labour-input than it was in 1998/99.

Despite a decline in total labour-input on many farms in the FBS over the past 20 years, driven by the fall in full-time paid work, the number of individual people in the average farm workforce has been increasing. The average farm workforce is more diverse than previously, in the sense that it is more common to find spouses, family members and casual staff working in the farm business at some point during the year. This may help farms to adjust their supply of labour, and it has been argued that widening the labour network also improves farm resilience (see Chapter 2). Increasingly, business partners complement and support the principal farmer, even if they are not working full time or 2,200 hours a year (more of which below).

To address Research Question 3, the FBS data were also studied for signs that certain farm labour systems might be stretched or under-employed. From this, it is possible to reach some tentative conclusions on the capacity of livestock farm labour systems.

To return to the first question for this exercise, *Is there evidence that people who work on English livestock farms are working longer hours than in the past?*, the FBS suggests that no, the hours worked by individual members of the farm workforce tend to have fallen in the past 10–20 years, with some exceptions. Notably, on dairy farms, the FBS data show that yes, the average principal farmer and farmer's spouse do both work longer hours now than in 1998/99. There has also been an increase in the average hours of full-time and part-time workers on medium-sized dairy farms, and business partners and part-time workers on large dairy farms. The FBS shows that dairy farming is labour-intensive not only in the sense that it requires a large workforce, but also in terms of the long hours worked by the owner, family members and paid staff. The growth in labour-input on large dairy farms seems related to intensification and expansion in that part of the industry, but the FBS reveals long hours worked by principal farmers on smaller dairy farms too. Perhaps the time demands of dairy-specific requirement schemes, revealed in the previous chapter, have also had an effect. Potentially, some of the spouses' additional time is spent on paperwork, which is an area of work that is often done by women (Gasson, 1992).

In the beef and sheep sectors, however, working hours have tended to shrink since 1998/99, except for possibly the hours of the average full-time staff member on lowland farms and part-time staff members on LFA farms. LFA and lowland farms have been quite badly affected by the output-cost squeeze but, interestingly, we do not see clear evidence in the FBS for over-employment among household members in response to the declines in full-time paid labour – rather, the average hours worked by principal farmers, spouses and business partners have tended to fall too, although input from spouses has re-bounded since 2008/9. Possibly some farmers have been doing more off-farm work, or simply reduced their activity as they got older. The larger LFA farms are an exception – they show signs of growth in some workers' hours similar to very large dairy farms, albeit less among full-time staff and more among spouses, flexible workers and contractors.

On mixed farms (which may or may not have livestock), there is perhaps an indication of husbands and wives working longer hours while other members of the workforce work less. The average hours of principal farmers in mixed farming have increased since 1998/99 and have pushed some of them into over-employment. On the average medium and large mixed farm, farmers' spouses are also working longer hours than 20 years ago, although on small farms their average hours have fallen. Business partners have become more common on mixed farms but individually they are working fewer hours, and the hours worked by the average paid full-time and part-time worker also appear to have decreased on most sizes of mixed farm since 2008/9 at least.

What about the second question, *Is there evidence for surplus labour and under-employment on farms, or for some farms' labour systems becoming stretched?*

The FBS does show a widespread reduction in farm workforce capacity in recent years and that over time, the actual labour-input or AWU recorded by the average farm business has fallen below the estimated amount of labour that would be required for a farm of that type and size, SLR. This could be an indicator that farm labour systems have become more stretched. Documented cost pressures may have made labour less affordable over time and therefore eroded any labour surpluses. However, there are more positive possible explanations for why AWU has fallen below SLR, such as improvements in labour productivity and labour–technology substitution. One sign of this is the increased use of agricultural contractors with machinery, which represents a shift in the pattern of employment from in-house staff to outsourcing of work. Additionally, opportunity costs may have led spouses and business partners to spend more time working in off-farm employment, although we cannot see this from the FBS data.

If we consider the hours that FBS participants estimate are worked on the farm, it does suggest that some members of farm workforces may be in a state of over-employment. In the FBS, it is principal farmers who tend to work the longest hours of all members of the workforce. On all sizes of full-time dairy farms and on medium or large lowland and mixed farms, the average principal farmer works over 2,200 hours/year, which suggests they are over-worked to some degree. Business partners also work over 2,200 hours/year on large dairy farms. In some of these farms, and especially in the dairy sector, the labour systems might be a little stretched.

On upland LFA farms, the average principal farmer works less than 2,200 hours/year. This could indicate possible under-employment or labour surplus in this sector, although there may be other contributors to the comparatively low labour-input such as ageing farmers entering semi-retirement or younger farmers earning off-farm incomes.

When it comes to small farms in the FBS, there is little evidence that their labour systems are particularly stretched – although we do not know to what extent farmers' spouses on small farms might be working very long hours when on-farmwork, off-farm employment and carework are combined. If anything, it is the larger farms in the FBS that show signs of over-employment. Some of the longest hours were recorded on medium-sized farms, and it may be that this scale of farm business, which is larger than a small operation but not large enough to have substantial non-family labour, is susceptible to its labour system becoming stretched. Unless the paid workforce is substantial, principal farmers do not appear to be using paid labour to substitute for their own labour; they are using it in addition to working longer hours themselves. Indeed, the FBS does not suggest that the average paid full-time worker is over-worked, except on medium-sized lowland farms. Over-employment is more visible among their employers: principal farmers and possibly business partners. Whether some over-employment is also occurring among casual workers or agricultural contractors, to whom some farm labour has evidently shifted over the years and whom Nye (2018) has described as agriculture's invisible labour force, is not captured in the FBS.

7. Livestock farms in the study regions: a snapshot of production, marketing and labour systems

With the analysis of secondary data from requirement schemes and the FBS completed, the study now moves to the primary data gathered from the questionnaire survey and interviews. The results are presented in the next four chapters, 7–10. This chapter begins by providing an overview of the production systems, marketing routes and workforces of the participating farms. The findings in this chapter are particularly relevant to Research Question 1a, 'What are the labour patterns of livestock production and marketing systems?'.

In this and subsequent chapters, the terms *farm* or *farm business* are used to refer to a single farm entity included in the survey or interviews. The term *enterprise* is used to refer to a discrete enterprise within that farm entity, such as a beef enterprise or a tourism enterprise.

Chapter 3.3 above provides detailed information on the questionnaire and telephone interviews. As a quick reminder, a postal survey was administered among 230 respondents from Herefordshire (79), Shropshire (89), Wiltshire (46) and Powys (16). Each farm was categorised as dairy (58), LFA (39), lowland (53), mixed (70) or smallholding (10) (Figure 7.1).

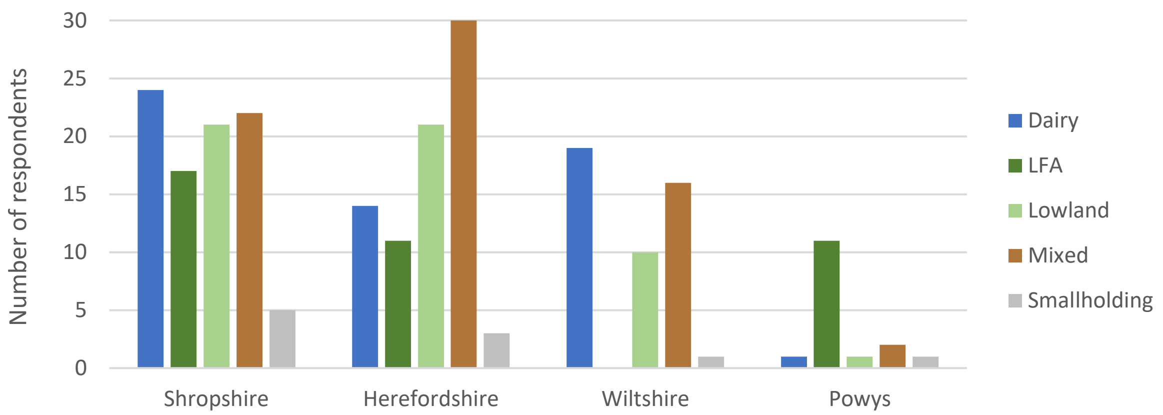


Figure 7.1. Distribution of survey respondents by county and farm type (*n*=230)

The farm businesses were approximately 199 owner-occupied farms, 29 tenant farms, one grazier business and one specialist breeding business. These numbers are estimates because the questionnaire did not capture exactly how many respondents were tenant farmers. As the 29 known tenant farmers represent only 13% of the sample, whereas tenant farmers make up 31% of the UK utilised agricultural area (Eurostat, 2018), it is likely that there are several more tenant farms in the sample. The farm sizes by area ranged widely, and the largest farms tended to be in Wiltshire (Figure 7.2).

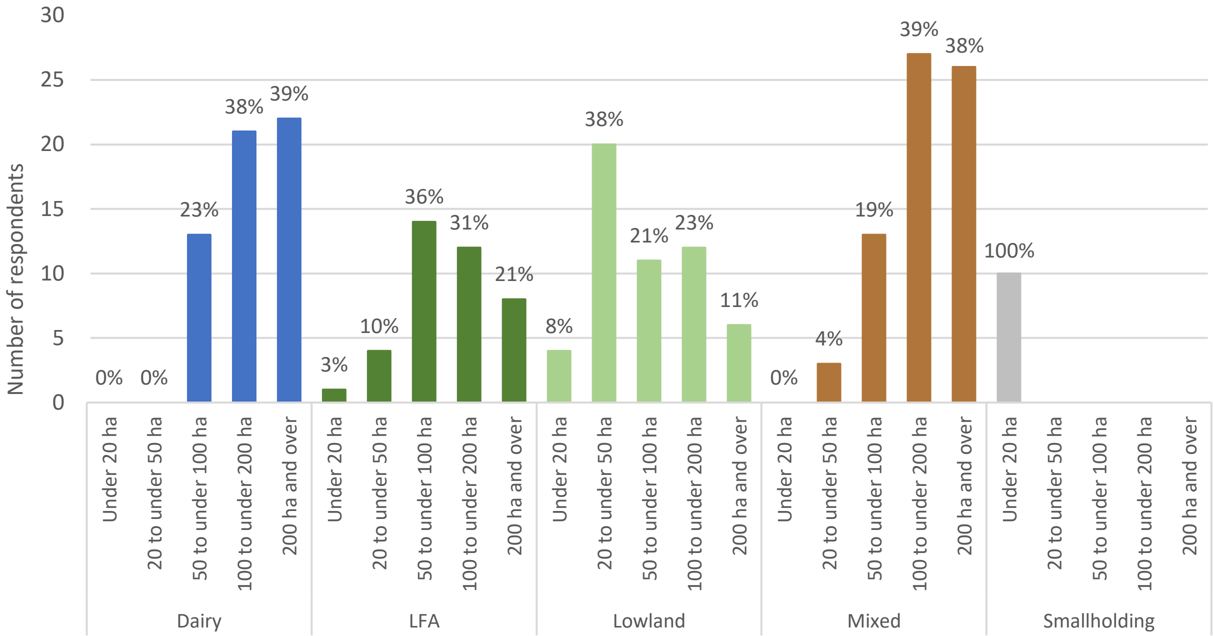


Figure 7.2. Distribution of survey respondents by size group (farmed area) (*n*=226)

Percentages show how many of that farm type are in each size grouping

Telephone interviews were held with 34 of the survey respondents. The interviewees comprised 23 men and 11 women. Most were a principal farmer or business partner, but two were employed managers (dairy manager and herd manager) and one was a farmer's wife who was less involved in the farm business. Most were middle-aged or approaching retirement age, but six were younger with young children, three were in their twenties or early thirties and four were aged over 70.

7.1 Livestock production and marketing systems

7.1.1 Production systems

A full table summary of the respondents' livestock production systems is provided in Appendix 10. Most of the farms in the survey (84%) had beef and/or dairy cattle, and 65% had sheep. Just over one quarter (27%) had a single farming enterprise, split evenly between specialist beef (9%), sheep (9%) and dairy (9%). The rest (73%) were multiple-enterprise farms.

Some respondents from lowland or LFA farms grew forage crops such as maize, barley or fodder beet, which is allowed for within the Defra classification (Defra, 2012). When considering respondents' production systems, therefore, it is important to be aware that some of the beef and sheep farmers cultivated crops, in addition to keeping livestock and producing hay and silage.

Nearly one-fifth of surveyed farms (*n*=42, 18%) were certified to follow an eco-extensive production system: organic, Pasture For Life or Free Range Dairy. These schemes require outdoor grazing on pasture for at least part of the year, and limited application of inputs (PFLA, 2014; Soil

Association, 2019; ECFR, 2020; Free Range Dairy, 2020; OF&G, 2020). Table 7.1 shows that the mixed farm category has the highest proportion of eco-extensive farms (23%). By county, 33% of the Wiltshire farms were eco-extensive – a much higher proportion than in Herefordshire (19%), Powys (13%) or Shropshire (11%).

Table 7.1. Eco-extensive farms in the survey
Data source: survey dataset

	Eco-extensive		Not eco-extensive	
Type	**Number**	**% of total**	**Number**	**% of total**
Dairy	12	21%	46	79%
LFA	5	13%	34	87%
Lowland	9	17%	44	83%
Mixed	16	23%	54	77%
Smallholding*	0	0%	10	100%
Total	42	18%	188	82%

*A smallholding as defined in this study cannot be eco-extensive.

Several of the farms, notably the LFA farms, were not certified eco-extensive but were likely to have extensive low-input livestock systems, as they farmed in the uplands. Sixty-seven (69%) respondents said they farmed at least partly in upland areas, of which 56 are estimated to be in an LFA. Such areas are typically used for suckler beef systems and ewe lamb production, where animals are grazed on unimproved or semi-improved pasture and hardier breeds may be out-wintered (Short & Dwyer, 2012; NFU & NFU Cymru, 2019). Stocking densities are typically low, especially since headage payment incentives were removed (Condliffe, 2009; Garnett et al., 2017). However, the four LFA interviewees who reported growing fodder crops highlight that it would be wrong to assume that all upland farmers have only permanent pasture or rough grazing.

Feeding and housing

The most common housing practice among the 192 surveyed farms with cattle was to graze the cattle outdoors in the summer and house them in the winter. This was done in 88% of the beef enterprises and 89% of the dairy enterprises. A small number grazed cattle all year round. In 16% of the dairy enterprises, some or all of the dairy cattle were housed year-round. This is probably a lower percentage than the dairy industry as a whole (Shorthall, 2019), perhaps because of the large number of eco-extensive dairy farms in the survey, which are not permitted by their certification schemes to permanently house animals. The results for beef cattle housing, which includes 6% housed year-round, are similar to the findings from a survey of livestock farmers that Defra conducted in 2019 (Defra, 2019e).

Of the 150 respondents with sheep, 49% selected ‘Outdoor grazing with winter housing’. Where it was evident from respondents that the sheep are largely out-wintered and housed only for lambing, they were moved to the outwintered category, but nevertheless the percentage of farms that housed sheep over the winter seems high and it may include further farms that used winter housing mostly during indoor lambing.

As for grazing systems, a sizeable number of beef and sheep enterprises in the survey followed set stocking, most commonly on the LFA farms, but most beef cattle and sheep were grazed rotationally between fields (Table 7.2). More intensive rotational grazing techniques such as mob grazing were followed by only 6% of the beef or sheep enterprises, but 54% of all dairy enterprises. A few of the dairy enterprises provided forage from on or off the farm for zero grazing systems.

Table 7.2. Grazing regimes used for all cattle and sheep on the farm (*n*=221, percentages for each farm type)
Data source: survey dataset

Grazing regime	Dairy	LFA	Lowland	Mixed	Small-holding	Total
Set stocking	3 5%	10 26%	6 12%	12 18%	2 20%	33 15%
Rotational grazing	15 27%	24 63%	33 65%	39 58%	8 80%	119 54%
Set stocking and rotational grazing	4 7%	3 8%	6 12%	7 10%	0 0%	20 9%
Some or all intensive rotational grazing	30 55%	1 3%	6 12%	8 12%	0 0%	45 20%
Zero grazing alone or combination but no intensive rotational grazing	3 5%	0 0%	0 0%	1 1%	0 0%	4 2%
Total	55	38	51	67	10	221
Missing answer	3	1	2	3	0	9
Grand total	58	39	53	70	10	230

Calving and lambing

Around three-quarters of the survey respondents' farms (*n*=168) did calving. Just over half of them (55%) calved in blocks, either once or twice a year. Block calving was especially common on mixed farms and eco-extensive farms. The remaining 45% did all-year-round calving, including 78% of the dairy farms.

A smaller number of the surveyed farms did lambing (*n*=140, 61%). The most common method was indoor lambing once a year (*n*=86, 61% of all farms that did lambing). Only a small number of respondents had indoor lambing more than once a year. The remainder (*n*=46, 33%) practised outdoor lambing, typically alone but sometimes in combination with some outdoor lambing.

Just as eco-extensive farms were more likely than non-eco-extensive farms to do block calving, they were also more likely to do outdoor lambing. By farm type, LFA farms were the most likely to solely do outdoor lambing (29% of all LFA farms that did lambing). This percentage drops to 19% of lowland grazing farms, 15% of mixed farms and 14% of dairy farms.

Twenty-four of the respondents with cattle did not do calving. One of them was a grazier and another explained in the questionnaire that they had retired their cows and were no longer calving. The others probably acquired youngstock or stores for finishing or breeding. Similarly, 10 of the surveyed farms with sheep did not do lambing. These predominantly lowland farms may have acquired store lambs for finishing. One of the respondents explained in the questionnaire that they had stopped producing lamb ewes and now purchased lambs to sell as yearlings.

Milking

Almost all the dairy farms milked their cows conventionally twice a day. Two of the non-eco-extensive farms did robotic milking, and one had contracted out the milking to someone else.

7.1.2 Marketing and diversification

Livestock marketing

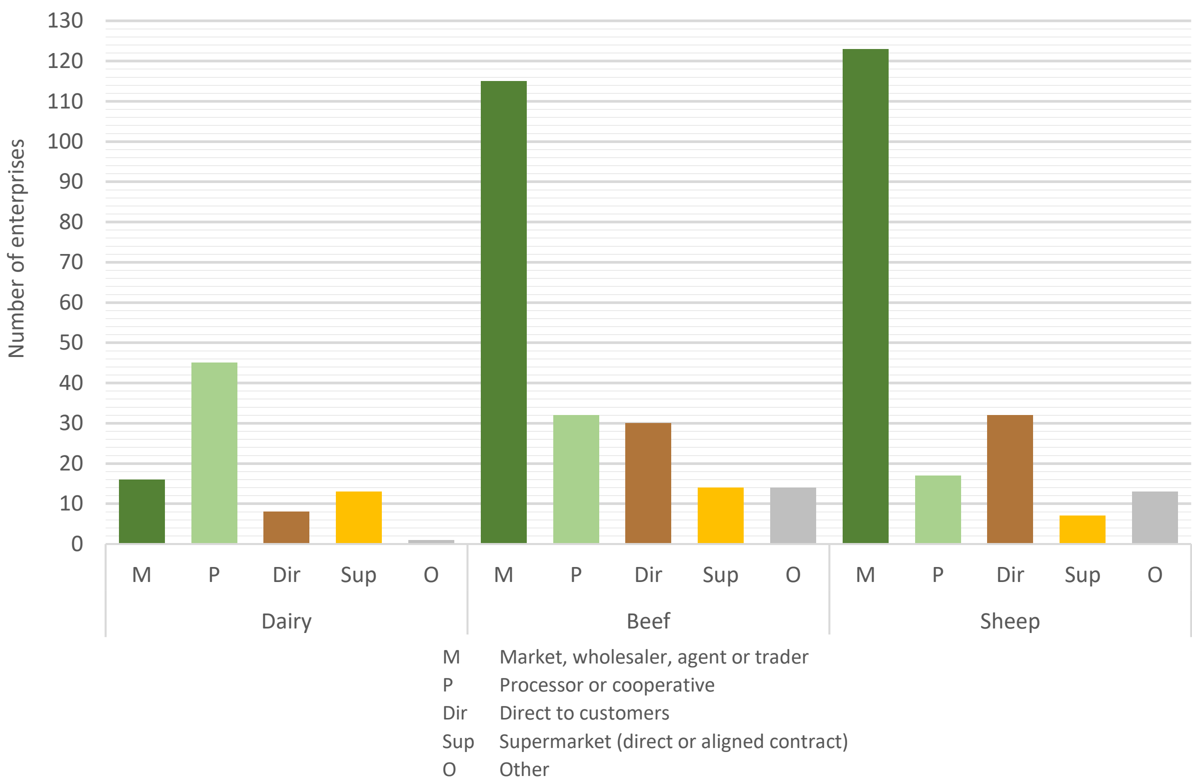


Figure 7.3. Marketing channels for dairy, beef and sheep
Data source: survey dataset. Covers 57 dairy, 160 beef and 148 sheep enterprises. Respondents could select more than one marketing channel. Total responses: *n*=228

The farms used a range of marketing channels for their livestock, meat and milk. The most popular were livestock markets, wholesalers, agents or traders, used for 72% of all beef enterprises and

83% of all sheep enterprises. These channels are especially common among LFA farms (Figure 7.4). We would expect livestock markets to be well represented in the respondents' answers, since 78 of the surveyed farms were found for the sample through livestock auction catalogues.

For dairy enterprises, it was typical to sell milk to a processor or cooperative (79% of all dairy enterprises). Only 16% of dairy enterprises, 7% of beef enterprises and 4% of sheep enterprises sold directly to a supermarket. Direct selling of livestock products was more common than selling to a supermarket, being reported by 23% of farms in the survey (Figure 7.3). The questionnaires did not give a good indication of the 'Other' channels might be; one possibility could be selling through a website such as www.sellmylivestock.co.uk.

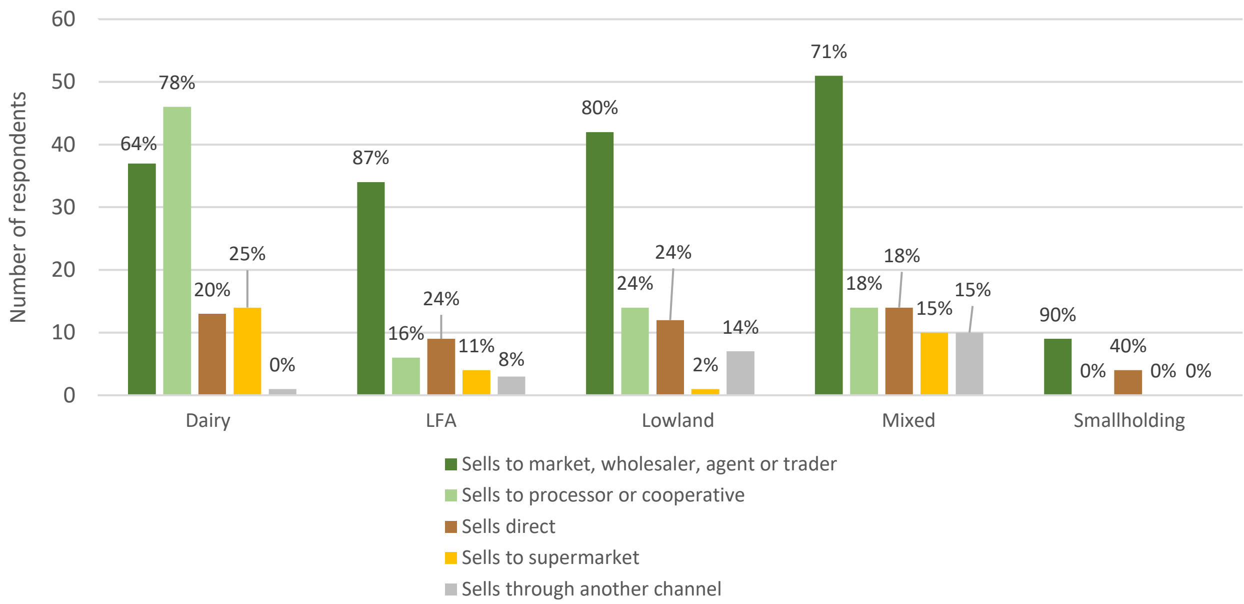


Figure 7.4. Marketing channels for dairy, beef and sheep, by farm type (*n*=228)
Data source: survey dataset
Shows percentage of respondents who used each channel.

All marketing channels

Some of the dairy farms and smallholdings, and all of the mixed farms, sold non-livestock products like cereals, vegetables or poultry. Based on the incomplete information available,[12] a summary of marketing channels for each farm type is shown in Table 7.3. It shows at least 24% of the dairy farms and 20% of the mixed farms sold milk, meat or non-livestock produce to a supermarket. But only a small percentage of LFA farms (10%), a negligible number of lowland farms (2%) and none of the smallholdings sold to a supermarket.

[12] Fifty of the 73 respondents with non-livestock enterprises did not answer which marketing channels they use for those enterprises.

On average, each farm used 2.1 types of marketing channel for its livestock produce. When we add non-livestock produce, the mean rises to 2.4. On average, dairy farms used the most types of marketing channel (2.5), and smallholdings the fewest (1.6).

Table 7.3. Marketing channels for livestock and non-livestock produce* of surveyed farms, by farm type (*n*=228, respondents could select more than one channel type)
Data source: survey dataset

	Market, wholesaler, agent or trader	Processor or cooperative	Direct straight to customers	Supermarket (direct or aligned contract)	Other	Average number of channels	
						Livestock produce	All produce*
Dairy	37 64%	46 79%	15 26%	14 24%	1 2%	2.4	2.5
LFA	34 87%	6 15%	9 23%	4 10%	3 8%	2.3	2.3
Lowland	42 79%	14 26%	13 25%	1 2%	7 13%	2.0	2.0
Mixed	58 83%	23 33%	20 29%	14 20%	13 10%	1.9	3.2
Smallholding	9 90%	0 0%	5 50%	0 0%	0 0%	1.4	1.6
Total	180 79%	89 39%	57 25%	33 14%	24 11%	2.1	2.4

* Information on non-livestock produce for 50 of 73 dairy and mixed farms is missing.

Direct selling

Based on the incomplete data for all farm produce, selling direct is more common among eco-extensive dairy farms and mixed farms than other types of farm. Direct selling was done by 44% of all eco-extensive farms, versus 24% of the non-eco-extensive farms, which is a statistically significant association of p=0.008 (see section 3.3.4.3 for an explanation of the statistics used to test correlations between variables in the survey). Examples include direct milk sales and vegetable box deliveries.

Of the 52 farms that direct sold livestock products, only 11 did not use another marketing channel; most also used a market, wholesaler, agent or trader to sell the products. This supports the observation of Goodman (2004) that alternative routes to market are often used as a diversification strategy rather than to replace mainstream routes.

By county, direct selling was most common among the farms in Herefordshire (32%, versus 29% in Wiltshire and 27% in Shropshire). Farms in the remotest areas were least likely to do direct sales: there was also a significant negative association between direct selling and being located in a sparse hamlet or isolated dwelling (p=0.047).

Diversification and contracting

Of the farmers in the survey, 34% had an on-farm diversification enterprise and 25% offered agricultural contracting (Table 7.4). Taken together, 24% just did diversification, 14% just did contracting, 11% did both and 51% did neither. The percentages for diversification are a little lower than the percentage of farms that reported output from on-farm diversification in the 2018/19 FBS for England, which ranged from 50% of LFA farms to 71% of mixed farms (see section 2.3.5).

Diversification was most common among eco-extensive farms and mixed farms, but negatively associated with LFA farms.

As with direct selling, diversification was least common among farms located in sparsely populated hamlets and dwellings (26% of such farms, compared with 27% of farms in sparse villages, 32% of farms in non-sparse hamlets and 38% of farms in non-sparse villages), although this is not statistically significant. Farms in Shropshire were the least likely to have a diversification enterprise (25%, negative association of p=0.026). Meanwhile, farms in Wiltshire were the most likely to have a diversification enterprise (54%, positive association of p=0.001). There is no clear explanation why diversification should be particularly uncommon in Shropshire, but the large number of diversified farms in Wiltshire is probably linked to the high proportion of mixed, eco-extensive and non-remote farms in the Wiltshire part of the survey sample.

Table 7.4. Number and percentage of surveyed farms with an on-farm diversification or contracting enterprise, by farm type

Data source: survey dataset

	Diversification ***n*=228**	**Contracting** ***n*=230**
Dairy	18 31%	14 24%
LFA	8 21%	9 23%
Lowland	20 38%	12 21%
Mixed	30 43%	20 29%
Smallholding	2 20%	2 20%
Total	78 34%	57 25%

Similar to diversification, Shropshire had relatively few respondents with an agricultural contracting enterprise (20%), compared with 33% in Wiltshire and 28% in Herefordshire, but only 13% in Powys. By farm type, the percentages of farms doing contracting are evenly distributed (see Table 7.4). Eco-extensiveness is not associated with having a contracting business; indeed, only 17% of eco-extensive farms did so, versus 27% of non-eco-extensive farms. There was also no clear association with farm size as measured in farmed area. Farms with arable (28%) were slightly more likely to offer contracting than farms without arable (23%), as were farms with cattle (26%) versus farms without cattle (17%), but these are not statistically significant associations.

7.2 Labour requirements of surveyed farm systems

7.2.1 Farmwork

From the interviews, indoor lambing emerged as one of the most labour-intensive parts of livestock farming. Mucking out pens, feeding and watering ewes and checking the animals all take time. Preventing and dealing with illness and disease can also be intense. Farmers often worked extremely long hours during lambing. Respondent 53, a lowland farmer in Herefordshire, said he typically worked about nine hours a day in summer, but as much as 21 hours a day during lambing. Respondent 124, also from Herefordshire, said lambing usually took two weeks on his farm but in 2020 it lasted one month: “It was a bit shattering.”

Outdoor lambing was generally perceived by interviewees as less labour-demanding, partly because there is less nighttime work involved. Respondent 109, an LFA farmer in Herefordshire, explained: “You can’t interfere with the ewes too much if you check them outdoors at night, it will upset them.”

Other time-consuming aspects of sheep-keeping included seasonal tasks such as foot-trimming and vaccinating. Respondent 95, an older LFA farmer, still used plunge dips rather than sprays for treating blowfly strike, which took around two days a year and he described as “bloody hard work”. The comments confirm observations in the literature on labour-demanding tasks in sheep farming (Kirwan, 2010; AHDB, 2016; Smith, 2017). The *John Nix Pocketbook for Farm Management* (Redman, 2017) estimates that most types of cattle enterprise have higher labour requirements than sheep farming. Similarly, researchers who investigated upland livestock farming for Defra (Gaskell et al., 2010) reported that beef farms were more labour-intensive than sheep farms. However, some interviewees suggested that sheep require more work than cattle, or at least, did not repay the effort required: “A lot of work for not much return,” is how Respondent 53 phrased it. Respondent 73 explained the economics: “For one ewe, you keep her for 12 months, and she’ll have one and a half lambs, on average. The lambs will get £80 [at market], so that means in 12 months, that ewe will only earn you £120. That might be OK if you have thousands of ewes, but not if you have a few hundred like we did.”

For those with cattle, calving was another peak time that can involve long hours, especially if it coincides with lambing or winter housing of youngstock. Interviewees discussed the trade-off between year-round calving, which spread the labour throughout the season, and condensing calving into tighter blocks of time, usually in spring, summer and/or autumn, which freed up workers during the rest of the year (Porter, 2014). Respondent 200 from Shropshire was one of the small number of dairy farmers practising block calving. "We hope that, with the seasonality of the spring calving system, it means that you get a relatively easy time at some point in the year, and [staff] know that." Dairy farmer 210, who also did block calving, estimated that his full-time staff each worked around 50 hours a week during calving, but at quieter times their hours dropped below 40.

Interviewees with cattle enterprises faced high labour demands for rearing calves and youngstock. Respondent 66 in Shropshire had quit dairy some years previously and turned some of their milkers into suckler cows, whose youngstock were reared to 12–15 months. The extra work in feeding and housing was a shock to him: "It took a couple of years to get my head around it," he said. For similar reasons, housing older cattle during winter was a major area of labour for beef and dairy enterprises. *John Nix* (Redman, 2017) estimates that on average, a housed beef finishing system requires 1.8 person hours per head per month, whereas a summer grazing finishing system requires only 0.2. Even more labour-demanding are young calves up to 3 months (2.3 hours/head/month) and dairy followers (youngstock) during winter when they are housed (2.9 hours/head/month).

Upland farms probably have to winter-house cattle for longer, because of cold weather – until May, in the case of Respondent 235's LFA farm in Shropshire. Cold weather can also force LFA farms to house ewes inside for longer during lambing or rule out outdoor lambing as an option. Even when animals are outdoors, upland winters are a struggle. Respondent 243, another LFA farmer in Shropshire, described the physical hard work involved in checking animals in snow and ice. Respondent 376, who farms in a lowland but exposed area, said, "You get tired and cold in the winter. It sounds stupid, but the cold slows you down." The challenges of upland farming are supported in the literature (Short & Dwyer, 2012; Northern Upland Chain Local Nature Partnership, 2016; Redman 2017). Tractor jobs or tasks such as fencing can take longer on steep, uneven land than on light soils and flat land (Redman, 2017).

The dairy farmers described fewer seasonal peaks and troughs, partly because of the predominance of year-round calving. Two interviewees who had quit dairying commented that their personal workloads had got easier, mainly because they did not have to get up so early in the morning for milking. In a study for AHDB, Webster et al. (2008) measured the labour-input on eight dairy farms. Milking was by far the most time-consuming task in dairying, followed by rearing youngstock.

The demand for labour in livestock farming across the farming calendar is greatly influenced by whether the farm has dairy cattle, suckler cows, store cattle, breeding ewes and/or store lambs, and by the timing of any associated lambing, calving, rearing and winter housing. Note, for example, the following exchange with an LFA farmer who had over 600 breeding ewes, a suckler herd that was winter-housed and some arable land for cereals:

> Researcher: "Do you think that sheep need more work than cattle?"
>
> Respondent 109: "Well, in the winter, the cattle are more work, because they're indoors, they need feeding every day. In the summer, the sheep need more work, you know, with drenching and so on. Then in spring we have to be out applying fertiliser to get good spring grass, so…"

Respondents varied in their opinions on the labour intensity of field operations during the summer. Workloads are influenced by the size of the farm workforce and how many of the field operations (e.g. ploughing, fertilising, haymaking, silaging) are done by contractors. Workloads could be quite heavy on mixed farms with arable or horticulture, as with the case of Respondent 146, a farmer's son from a mixed farm in Wiltshire, who reported working 10–12 hours a day in summer. Generally, it seems that although farmers may work long hours in the summer, taking advantage of the long evenings, the work is less stressful than lambing and calving. However, interviewees said it could be difficult and time-consuming to move livestock to fresh pasture in summer months. This was particularly annoying for farms with very large acreages, more than one site or fields that are separated by main roads and require extra people to move the animals safely. Respondent 389 mentioned disadvantages of working across two farm sites in Wiltshire: "If a vehicle is in the wrong place and you have to send someone eight miles to go and get a bolus gun, it's not great." Respondent 243, an LFA farmer in Shropshire, said summer drought had caused them to move livestock to fresh pasture more frequently than planned, which created stress and additional work: "We have five small fields… they're connected by lanes so it takes three people to move the cattle – you couldn't do it with one person."

Field operations on eco-extensive farms were affected by their need to produce home-grown fodder and to cultivate grass and crops without synthetic fertiliser or pesticide. They may need to spend more time than conventional farms in growing fodder, managing and analysing soil, and avoiding weeds. In the words of one organic dairy farmer, "We can't just fix a problem with spraying" (Respondent 200).

Workloads tended to increase with the physical size of farm and number of animals. But there may be economies of scale that larger farms can benefit from. For instance, Respondent 83, who lambed his ewes outdoors, said, “It gets to a point where if you are out checking 100 sheep, it might as well be 300 sheep – the scale of it makes the labour pay.” Respondent 146, from a mixed farm with small beef and sheep enterprises, discussed the inefficiencies of setting up to administer vaccinations for only small numbers of livestock. Also, in some cases decreasing the farmed area can add to the workload. This was experienced by Respondent 52, a lowland tenant farmer in Herefordshire, whose landlord unexpectedly withdrew a portion of land. This forced them to erect new fencing and move sheep more often.

7.2.2 Diversification and direct selling

In comparison with lambing and calving, the workloads involved in diversification or direct selling did not seem to be so heavy for most interviewees. Two of the dairy farmers had started selling milk from vending machines locally or at the farm. This had created more work, of a rather inflexible daily nature, but in both cases the additional income had enabled them to employ a new worker. Another farmer, Respondent 389, sold meat from a butchery on site, which had added to his workload:

> “Customer service and orders take up a lot [of time]. Then there’s the website, Facebook posts, uploading photos for the blog… You can do it here and there, a lot of it can be done on your phone. But it does add up. Maybe more than I would like to admit to… But it’s worth it, because you can see the profit it in there. I can spend an hour on an email and get £1,000 of sales out of it. And I quite enjoy it, the customer marketing stuff. I know you have to be careful with work you enjoy.”

Respondent 243 sold pedigree sheep direct from the farm, and described how that added to the workload at sales time:

> “It’s less stressful for the animals [than being transported to market], but it’s quite time-consuming to have people coming to the farm. They spend a lot of time looking [at the animals], lots of cups of tea, sometimes they don’t even make a decision. But we prefer doing it this way.”

Other forms of diversification were rarely mentioned as a notable source of work. Farmer 20 ran tourist accommodation on the farm in Herefordshire, which created work for her. During the Coronavirus lockdown she had stopped personally greeting guests, “and that’s taken some of the pressure off,” she said. Another interviewee with a substantial off-farm livestock haulage business said he worked long hours, 60–70 hours a week, but described his farmwork fitting around the haulage, rather than the other way around.

7.2.3 Questionnaire findings

The questionnaire asked respondents if they had made any changes to their farming system or marketing which had affected their workload or their demand for workers or contractors in the past 2–3 years. The respondents' answers shine some light on the labour intensity of certain farming practices (Table 7.5).

Table 7.5. Changes made by survey respondents to production and marketing systems which affected workload and demand for labour
Data source: survey dataset

Area	Increased workload or demand for labour	Decreased workload or demand for labour
Breeds and breeding	Changing cattle breeds Farming more commercial sheep	Moving from pedigree to stabiliser cows
Life stages of farmed livestock	Rearing calves or youngstock Finishing or fattening cattle Building up a closed herd by rearing replacements	Stopping rearing and fattening; perhaps selling stores or yearlings instead Buying more ewe lambs or ewe hoggs to sell as maiden yearlings Selling the suckler herd
Grazing and forage	More intensive rotational grazing, moving livestock to fresh pasture more frequently Feeding fodder beet	Moving to mob or rotational grazing Better grazing management (unspecified)
Calving, lambing and milking	Moving to lambing twice a year Moving to milking three times a day	Lambing in one block Moving to outdoor lambing Reducing calving groups
Housing	Housing high-yielding milk cows in summer Housing freshly calved cows Housing calves New sheep housing which requires mucking out with machinery	
Equipment and technology		Robotic milking, increasing capacity of the milking unit New sheep or cattle handling system New winter feeding system, updating sheds for faster feeding, robotic or automatic ATL feeding for cattle Electric fencing for rotational grazing Mobile water troughs
Enterprise balance	Fewer sheep and more poultry	More arable, less pasture Selling sheep or cattle Leaving dairy
Marketing	Direct selling milk or beef Pasteurising milk for direct sales New supermarket contract	Stopping direct milk sales Moving to a new buyer who has fewer requirements, privately selling heifers, pulling out of farm assurance scheme for livestock

Based on answers from 48 survey respondents whose workload or labour demand increased and 47 survey respondents whose workload or labour demand decreased.

In the main, the findings from the survey are consistent with findings from the interviews on labour intensity of different farming and marketing practices. Rearing and housing young stock, keeping pedigree breeds and frequent milking or lambing regimes were all reported to be labour-intensive; while outdoor lambing was reported to have labour-saving effects. Most starkly, quitting dairy or reducing beef or sheep to focus on a single livestock enterprise or increase arable farming instead were said to have reduced the overall work, although increasing production of a more labour-intensive system such as poultry or vegetables could see workload increase overall. The changes related to marketing also aligned with findings from the interviews and the literature: direct selling can add to the farm workload, especially if this refers to milk which the farmer must start pasteurising. However, the respondents' comments also show that when selling through more mainstream channels, the nature of the buyer and their requirements can have an effect on workload. For example, some respondents had saved time by selling heifers privately or selling lambs to a meat processor rather than at auction.

7.3 Farm workforces

This section describes the farm workforces reported by questionnaire survey respondents. Defining a farm's workforce is challenging, since so much farmwork in UK agriculture is done by unpaid family members and outsourced contractors. Nye (2017:21) uses the term 'farm labour contributor' to cover "any person contributing to physical labour on a farm, regardless of whether they are based on or off-farm, and of their status of employment". Errington & Gasson (1996) and Nettle et al. (2018) differentiate core works who are a more or less permanent presence on the farm from peripheral workers, such as seasonal staff, and external labour, such as agency workers.

This study proposes a broad definition of workforce that comprises all those who contributed labour-input to the farm business in the previous 12 months. The *internal workforce* comprises a *core workforce*, covering full-time and part-time workers of any type, and a *peripheral workforce*, covering casual and seasonal workers of any type. The *external workforce* covers contractors and informal help from other farmers. The latter category does not include sources of expert help such as vets or accountants, since their input was not systematically captured in the questionnaire.

7.3.1 The size of internal workforces

7.3.1.1 The survey average

Based on the recollection of the survey respondents, the average number of people who worked on a surveyed farm business in the previous 12 months is 4.6 people (n=215, excluding 13 missing responses and two outlier mixed farms with extremely large numbers of seasonal workers). The range is 1–40 people and the mode is 2 people (Figure 7.5). The collective labour-input represented by all recorded workers averages as 3.4 FTE per farm, using the coefficients discussed in section 3.3.4.1 (*n*=210, excluding 14 missing responses and the two outliers). The average FTE per 100ha of the surveyed farms is 3.4 (*n*=210). The average FTE/100ha for smallholdings is very large (17.4 FTE per ha). Excluding smallholdings, the average falls to 2.8 and the range narrows to 0.1–15.4 (*n*=200). Even so, this measure may be skewed towards smaller farms because labour is not infinitely divisible – even the smallest holding requires a minimum amount of labour-input and it rises at a slower rate than farmed area (Figure 7.6).

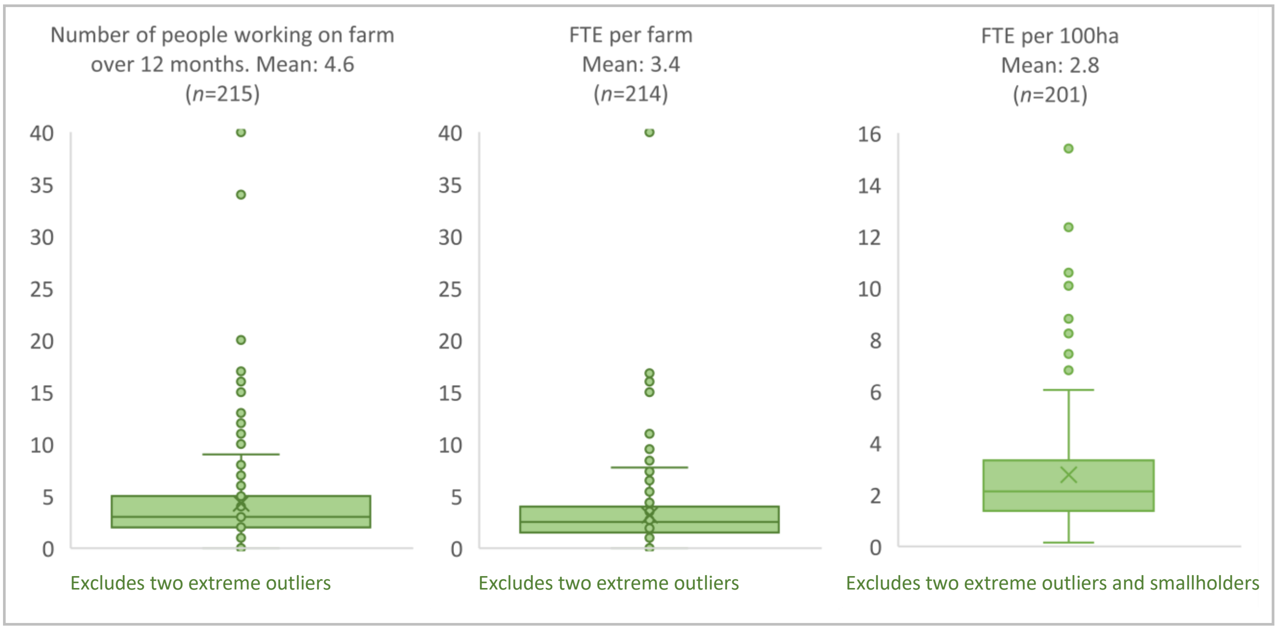


Figure 7.5. Size of internal workforce of surveyed farms
Data source: survey dataset

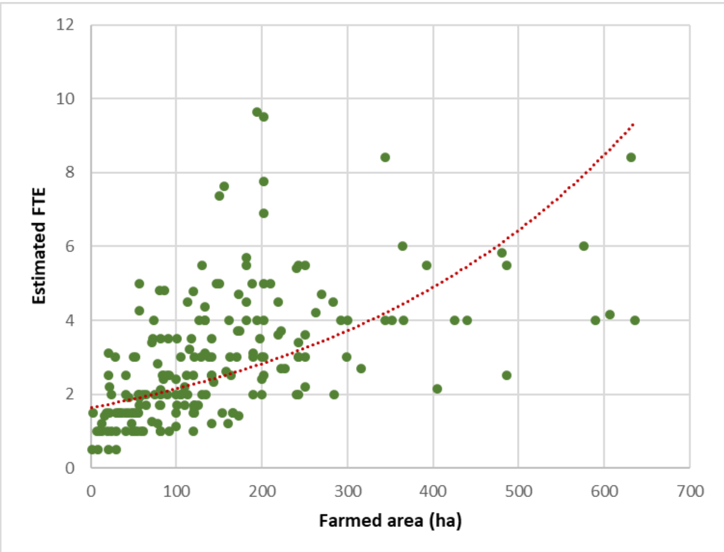


Figure 7.6. Exponential relationship between FTE and farmed area
Data source: survey dataset
Data exclude outliers above 10.0 FTE and 1,000ha, for purposes of illustration

FTE is used to estimate the manpower available in a farm's internal workforce, but is not an accurate measure of actual work done, since it does not take into account any variation in hours worked by individuals. A respondent who regularly works 10 hours a day and a respondent who also called themselves full-time in the questionnaire but worked more relaxed hours would both be considered 1.0 FTE. Likewise, the coefficient of 0.5 for part-time workers could cover someone who works one morning a week or three days a week. The FTE estimates could therefore conceal over-employment or surplus labour.

7.3.1.2 Associations with farm characteristics

The number of people in the internal workforce and FTE per farm both have a significant positive association with farmed area (p=0.000): in general, the larger the farm, the larger the internal workforce. There is a negative correlation between FTE per farm and the farm types that are over-represented by very small farms in the survey sample – lowland farms (FTE 2.0, p=0.003) and smallholdings (FTE 1.0, p=0.034). The LFA farms in the survey had a higher average FTE (2.4) and number of people (3.2, p=0.037) than lowland farms, although their internal workforces were still small (Table 7.6).

Table 7.6. Average internal workforce of surveyed farms, by farm type
Data source: survey dataset

Farm type	Average number of people who worked on farm in past 12 months	Average FTE per farm	Ratio of FTE per farm to number of people	Average FTE per 100ha
Dairy	7.3	5.9	81%	3.1
LFA	3.2	2.4	74%	2.9
Lowland	2.9	2.0	71%	3.5
Mixed	4.8	3.1	65%	1.9
Smallholding	1.6	1.0	62%	17.4
All farms	4.6	3.4	74%	3.4

Excludes two outliers with horticulture.

When we consider the kinds of livestock kept, we find that the smallest workforces are associated with farms whose only livestock are sheep, and the largest workforces are associated with farms whose only livestock are dairy cattle, indicating that the specialist dairy operations in the survey used more labour than the dairy farms which also raised beef cattle (Table 7.7).

Table 7.7. Average internal workforce of surveyed farms, by type of livestock
Data source: survey dataset

Type of livestock kept	Number of farms in survey	Average number of people who worked on farm in past 12 months	Average FTE per farm	Average FTE per 100ha
Sheep only	35	3.0	2.2	6.7
Beef cattle only*	36	3.5	2.6	3.3
Sheep and beef cattle	96	4.0	2.6	2.4
Dairy cattle only	27	8.7	7.1	3.4
Sheep and dairy cattle	6	6.8	4.6	3.1
Beef and dairy cattle	14	4.9	3.9	2.2
Sheep and beef and dairy cattle	11	7.0	5.9	3.1

* Excludes two outliers with horticulture.

Those livestock findings do not take into consideration whether or not the farm is a mixed farm with additional non-livestock enterprises. The size of the average mixed farm's internal workforce (3.1 FTE) is close to the mean. The data suggest that horticulture and orchards involve the most people of all non-livestock enterprises on mixed farms; but by spatial extent (FTE per 100ha), arable and field-scale vegetable operations use the fewest people and pig operations the most (Table 7.8).

Table 7.8. Average internal workforce of surveyed farms with mixed farming enterprises excluding 10 smallholdings
Data source: survey dataset

Farming enterprise(s)	Average number of people who worked on farm in past 12 months	Average FTE per farm	Average FTE per 100 ha
Dairy, mixed enterprise(s) and maybe also beef and/or sheep	8.0	6.9	2.7
Beef and/or sheep plus mixed enterprise(s)	5.0	3.5	1.9
Mixed enterprises include horticulture or orchards	7.2	4.1	2.5
Mixed enterprises include pigs	6.4	3.9	3.2
Mixed enterprises include poultry	6.2	3.7	2.3
Mixed enterprises include arable or field-scale vegetables only	5.0	4.1	1.9

Excludes smallholdings and two outliers. Mixed enterprises are arable, field-scale vegetables, horticulture, pigs and/or poultry.

On average, the dairy farms in the survey had the largest internal workforces by number of people and FTE per farm (7.3 and 5.9, respectively; both p=0.000). Dairy farms tend to have a higher ratio of FTE per farm to the number of people than other farm types, which indicates the large proportion of workers in full-time positions (see below).

Statistical analysis revealed a cluster of variables associated with dairy farming that were correlated with a larger than average internal workforce – having cattle but no sheep, year-round calving, zero grazing and intensive rotational grazing, and direct selling (see Appendix 11). Likewise, having only beef cattle and/or sheep, and especially only sheep, out-wintering livestock and set stocking are characteristics of extensive livestock systems that were all correlated with the small internal workforces reported for LFA and lowland farms.

Farms that did at least some lambing indoors had a larger average number of workers per farm than farms with sheep that lambed outdoors or did no lambing at all, and they also had a larger average FTE (2.8) than the outdoor lambers (2.4), although not the farms that did no lambing at all. While it is not possible to prove a causal link, this supports evidence for the high, peaky labour demand of indoor lambing; we return to a possible link between lambing and seasonal labour usage in Chapter 9 and Appendix 12.

Table 7.9. Average internal workforce of surveyed farms with eco-extensive certification, diversification or a contracting business

Data source: survey dataset

Farm type	Average number of people who worked on farm in past 12 months	Average FTE per farm
Eco-extensive	6.5	4.7
Non-eco-extensive	4.2	3.1
Diversification	6.4	4.4
No diversification	3.8	2.9
Contracting business	5.0	3.7
No contracting business	4.5	3.3
All farms	4.6	3.4

Farms with eco-extensive certification (e.g. organic) had a larger average workforce by estimated FTE and number of people than non-eco-extensive farms, a positive correlation of p=0.000 (see Table 7.9). This is perhaps attributable to the labour intensity of low-input production systems. However, it was noted in Chapter 2.3.5 that organic livestock production does not necessarily use more labour than conventional livestock farming. The eco-extensive farms in the survey were quite likely to be mixed farms and to have a diversification or direct selling enterprise. The literature suggests that both of these factors may have a stronger influence on the size of an organic farm's internal workforce than the labour demands of livestock production (see Chapter 2.3.5). Indeed, among the surveyed farms, having a diversification enterprise is positively associated with the number of people who work on the farm (p=0.000), as is direct selling to a lesser extent (p=0.043). Overall, the more enterprises in the farm business, the larger its workforce is likely to be.

The correlation analysis is consistent with several of the findings from the interviewees and literature about farm types, production practices and enterprises that can be particularly labour-intensive. However, we cannot assume that farms with small workforces do not have labour-intensive operations, even after adjusting for farm size. There may be over-employment within the workforce, perhaps with full-time farmers on operations with small workforces working longer hours than a 1.0 FTE suggests, for example. Some farms may have small workforces because they have better labour productivity than others, or forego more of the non-essential farmwork tasks. The extent to which a farm outsources work to contractors could also affect the size of its internal workforce relative to its theoretical labour requirements.

7.3.2 Sources of labour in form workforces

The range of labour sources captured in the questionnaire can be split into seven types: the farm owner or business holder; additional owners; family members; paid non-family members, including farm managers; students and volunteers; contractors; and other farmers providing informal help. Sources of expert help are not included.

7.3.2.1 Owners and family members

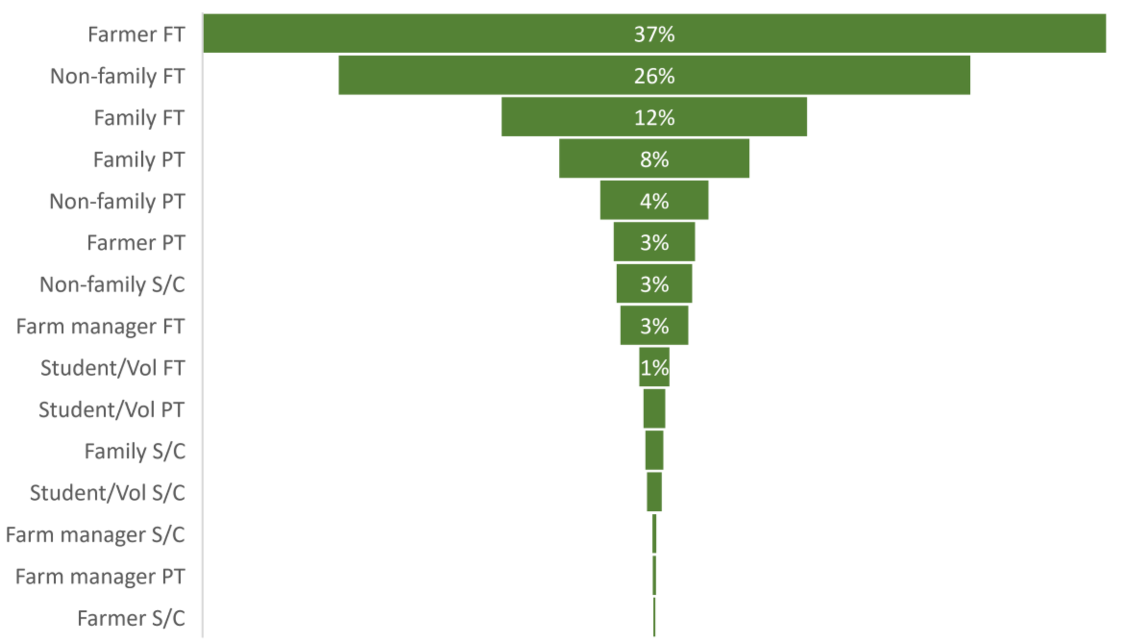


Figure 7.7. Funnel chart of average contribution from diverse labour sources to FTE per farm of surveyed farms (*n*=214) Data source: survey dataset

FT = full time; PT = part time; S/C = seasonal or casual; farmer = farm holders or business owners; student/vol = students or volunteers. Excludes two outliers with horticulture

Using the FTE estimates, it is possible to approximate the relative contribution of different worker types to the average farm workforce (Figure 7.7). The largest amount of labour-input was provided by farm holders/business owners, who contributed 40% of the average farm's FTE during the 12 months preceding the questionnaire. This was overwhelmingly provided by owners who worked on the farm business full time. All of the farms in the survey had at least one farm holder or business owner in the workforce, and 66% recorded additional input from family members. The questionnaire did not establish if family members were paid or not, and the interviews revealed that this category covers a range of situations from full-time family members who are paid a salary to unpaid family members who help on an infrequent, casual basis.

The LFA farms in the survey are interesting in that they recorded heavy use of family labour, with almost the same average number of family members as recorded by dairy farms, albeit working slightly less hours (0.8 FTE from 1.2 people, versus 1.0 FTE from 1.3 people in dairy). What makes the LFA workforces small is their exceptionally low use of non-family labour (Figure 7.8). On average, non-family workers contributed only 8% of estimated FTE over 12 months on the average LFA farm in the survey.

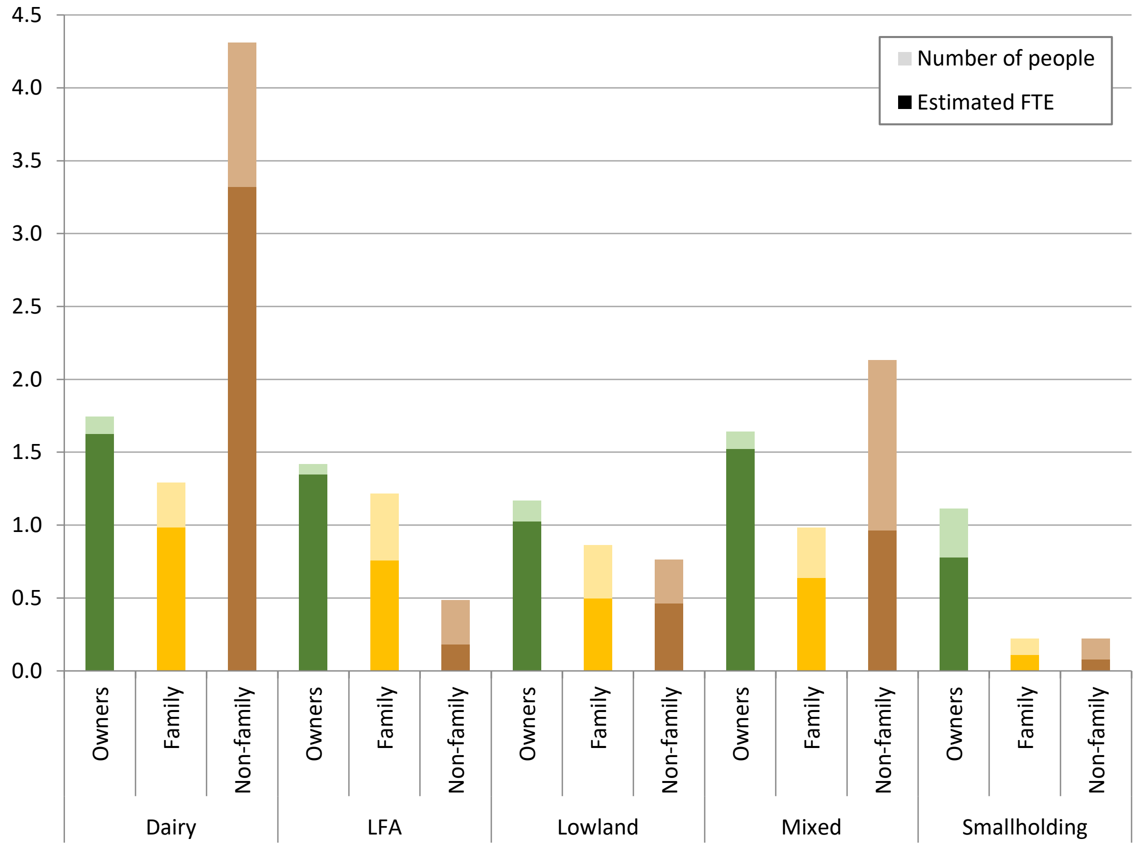


Figure 7.8. Contribution of farm holders and business owners, family members and non-family workers to the average farm business over 12 months (*n*=213), by number of people and total estimated FTE per farm

Data source: survey dataset

Mixed category excludes two outlier horticulture operations.

In comparison, the average lowland farm used more non-family labour (22% of FTE) and less labour from owners (50%) and family members (24%), although it should be remembered that many of the lowland farms in the survey were unusually small by farmed area. The unusually high proportion of labour from owners and family members associated with LFA farms – accounting for 92% of total FTE on the average LFA farm – is statistically significant (p=0.000), and the equivalent percentage for lowland farms, 76%, is also significant (p= 0.006).

Smallholders contributed almost all of the labour themselves.

7.3.2.2 Non-family workers

Around half (53%) of the farms in the survey used non-family workers to help meet their labour needs over the preceding 12 months. The internal workforce of the average dairy farm is the largest of all farms in the survey in every aspect: farm holders and business owners, family members and non-family workers. But it is particularly their use of non-family labour where dairy workforces are so exceptional, representing 43% of the people who worked on the farm in the previous 12 months and 37% of total FTE. Using non-family labour is also significantly positively associated with large farms by farmed area and with large workforces overall. Farms with a contracting business used more non-family labour than most but it is not statistically significant.

By far the most common type of non-family labour reported by survey respondents were paid workers and staff. They were used by 44% of the surveyed farms, and accounted for 85% of the total estimated FTE from non-family sources on the average farm.

Eco-extensive farms recorded particularly high use of paid workers and staff. Paid labour was not only used by a higher percentage of eco-extensive farms than non-extensive farms (60% versus 41%), it also tended to contribute more labour by number of people and estimated FTE. Sometimes, paid labour is used proportionally more on eco-extensive farms, and family labour proportionally less, even when the total labour-input is smaller. This applies to the four eco-extensive LFA farms in the survey, for example. Their average estimated FTE per farm of 2.1 was smaller than the 2.4 FTE estimated for non-eco-extensive LFA farms, but paid labour made up a greater proportion of that small FTE. Only one eco-extensive LFA farmer was interviewed and it was not clear from that discussion why practising a low-input system or becoming organic-certified would make farms like theirs more likely to hire non-family workers. These findings are consistent with other studies that have documented proportionally greater use of employed labour on organic farms than conventional farms (Lobley et al., 2006; Lampkin et al., 2014; see Chapter 2.3.5). The exception is on dairy farms, where eco-extensive systems are associated with more family labour and less non-family labour than the industry norm. This is reminiscent of the observations of Schewe (2015) that organic dairy farms in New Zealand preferred to use more family labour than their conventional peers.

Twenty (9%) of the farms employed a separate farm manager. This gives an average of 0.13 farm managers per farm, which is more than the 0.02 per farm recorded for all farms in England in 2018.[13] Employing a full- or part-time farm manager is positively associated with on-farm diversification, area farmed (p=0.028), being eco-extensive (p=0.050) and having a large FTE per farm overall (p=0.028). By type, farm managers were reported by 25% of the dairy farms in the sample, 16% of the mixed farms and only 8% of the LFA and lowland farms.

Additionally, 33 of the respondents reported that students and volunteers had worked for their business in the previous 12 months. This was most common on dairy farms, smallholdings and farms with a diversification enterprise. We would expect to find veterinary students on dairy farms and volunteers on smallholdings, but it is surprising that only 15% of farms that did indoor lambing had students or volunteers, since the National Sheep Association arranges student lambing placements each year. We might also have expected more than 15% of the eco-extensive farms to take volunteers, but perhaps organic WWOOFing occurs more often on horticultural farms that were not included in the survey. The estimated labour-input from students and volunteers over 12 months is small, averaging 3% of total FTE per farm (n.b. a smaller coefficient of 0.125 per person was used to estimate the FTE of casual or seasonal students and volunteers; see Table 3.13 for more detail).

7.3.2.3 Types of internal workforce

There was considerable variation in the composition of the internal workforces of the 225 farms in the survey who provided information. Five types of workforce identified among the respondents are depicted in Figure 7.9.

On a small number of farms (n=17, 8%), just a single farm holder or business owner worked on the farm business over the preceding 12 months. This would be the principal farmer counted in FBS surveys. They were typically small operations by farmed area and around a quarter of them are run on a part-time basis. On a further 17 farms (8%), the workforce was composed of more than one farm holder or business owner; a husband and wife, for instance.

More common, accounting for around one-third of the surveyed farms, was for additional family members to have been part of the workforce (n=72, 32%). This was the most common set-up for LFA and lowland farms. The largest group also used non-family labour: usually in addition to

[13] Calculated from average 'Number of farm managers (full time or part time)' for dairy, grazing livestock (LFA and lowland) and mixed farms in Defra (2019g).

family members (n=100, 44%) but in 19 cases (8%) just alongside the holder(s). Dairy farms overwhelmingly had this type of workforce, and it was also relatively common on mixed farms. Typically, the largest workforces by number of people and estimated FTE per farm occurred when there were both family members and non-family workers involved. However, there is little difference in size between workforces composed just of farm holders or business owners and workforces with additional family members.

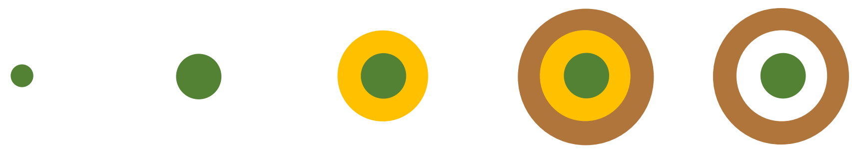
	Sole owner	Multiple owners	Owner(s) + family	Owner(s) + family + non-family	Owner(s) + non-family
					
No. of farms	17	17	72	100	19
Average no. people	1	2.8	2.9	6.7	4.3
Average FTE/farm	0.9	2.4	2.2	4.8	3.2
Dairy	2%	4%	16%	70%	9%
LFA	8%	18%	46%	21%	8%
Lowland	10%	6%	51%	25%	8%
Mixed	6%	6%	23%	57%	9%
Smallholding	40%	10%	30%	10%	10%
<20ha	36%	7%	36%	7%	14%
20-49ha	15%	11%	70%	0%	4%
50-99ha	14%	6%	36%	34%	10%
100-199ha	1%	10%	23%	55%	10%
≥200ha	0%	5%	18%	70%	7%

Figure 7.9. Stylised depiction of five types of internal workforce of surveyed farms (n=225), distributed among respondents by farm type and size grouping
Data source: survey dataset

The types can be aggregated into three groups: 'one person only' where a sole owner made up the workforce; 'owners and family labour', where there were two more owners or family members involved; and 'non-family labour', where the workforce included non-family workers. Correlation analysis confirms that using non-family workers is significantly associated with large workforces and large farmed areas (Table 7.10).

Table 7.10. Composition of internal workforce associated with size of surveyed farms (*n*=217)
Data source: survey dataset

	Average farmed area (ha)		Average number of people who worked on the farm in the past 12 months[a]		Average FTE per farm (estimated)[a]	
	Value	PC	Value	PC	Value	PC
One person only	48	-0.118	1.0	-0.204**	0.9	-0.233**
Owners and family labour	105	-0.192**	2.9	-0.252**	2.3	-0.295**
Non-family labour	291	0.255**	6.3	0.353**	4.5	0.413**

PC = Pearson Correlation, significant at 0.01 level (**).
[a]Excludes two outlier farms with horticulture.

7.3.2.4 Contractors

Most farms in the survey (88%) used agricultural contractors in the preceding 12 months. This is directly comparable with the findings of a 2017 survey of farmers in South West England, of whom 87% used contractors (Nye, 2018). It marks the rise in contracting since 1981, when Ball's (1988) survey of 211 farmers in Herefordshire, Shropshire and neighbouring Worcestershire, Staffordshire and north Wales recorded use of contractors by 70% respondents. Just as Ball and Nye found, most farmwork that was outsourced to contractors by respondents in the present study is seasonal field tasks that require machinery. The commonest tasks done by contractors according to survey respondents are silaging, baling, hedge-cutting and muck or lime spreading (Table 7.11). The most common task, silaging, was listed by 43% of the farmers that used contractors; nearly half of these are dairy farms. Silage-making has become much more widespread than in Ball's time, when it was recorded by only 9% of his surveyed farms (ibid.). Some respondents used contractors for infrequent tasks such as building work, or regular tasks such as mucking out sheds or emptying slurry lagoons.

Hiring contractors for livestock work such as sheep shearing was also reported. In an interview, one respondent said he paid for the services of a foot trimmer for his cattle; this was not mentioned in his questionnaire, and it is possible that other respondents also failed to mention some contracted work. This kind of contractor who works without heavy agricultural machinery would probably be counted as a casual worker in the FBS (Langton, 2014), and indeed some respondents might have counted them as such when filling out the questionnaire.

The findings suggest that the farms which used contractors for the most tasks had larger workforces than other farms, although this is not to say that they have surplus labour available. Mixed farms used contractors for the widest range of tasks, reflecting their varied nature. Ninety per cent of the 127 farms participating in a stewardship scheme used contractors. We might have expected to see greater use of contractors for typical stewardship activities such as hedge-planting, dry-stone walling and sowing species-rich mixtures (Courtney et al., 2013; Mills et al., 2018), but this was not the case. Perhaps one indicator is that they used hedge-trimmers less than the average farm (stewardship agreements tend to restrict hedge-cutting to certain times of the year to protect wildlife).

Table 7.11. Contractor tasks used by survey respondents in previous 12 months, by farm type (*n*=197) Data source: survey dataset

		Farms that used contractors for at least one task in this area				
Task area	**Total number of all farms**	**Dairy**	**LFA**	**Lowland**	**Mixed**	**Small-holding**
Silaging	84	71%	28%	25%	28%	10%
Baling	73	34%	28%	40%	30%	20%
Hedge-cutting	73	30%	41%	33%	30%	30%
Muck or lime spreading	55	41%	15%	21%	21%	10%
Combining and other arable operations	45	27%	5%	12%	33%	0%
Drilling, sowing and planting	44	30%	3%	19%	24%	0%
Hay, haylage or other pasture work	35	13%	8%	29%	13%	10%
Sheep shearing and other animal work	33	9%	21%	17%	12%	30%
Crop spraying	17	9%	0%	6%	13%	0%
Land preparation	18	7%	13%	4%	10%	0%
Bale wrapping	15	2%	8%	8%	10%	0%
Infrastructure, feed and haulage	14	13%	0%	6%	6%	0%
Fencing	7	4%	3%	6%	1%	0%
Ditches and drainage	3	2%	5%	0%	0%	0%
Tree work	3	0%	0%	2%	3%	0%
Fruit picking or harvesting	2	2%	0%	0%	2%	0%
Other	5	2%	0%	2%	4%	0%

The few farms that did not use contractors were disproportionately likely to be LFA farms (p=0.001) or smallholdings (p=0.005) or have a contracting business themselves (p=0.013). Also, LFA farms (p=0.018), smallholdings (p=0.008), farms with a contracting business (p=0.012) and farms with a high percentage of family labour (p=0.047) were positively associated with using contractors for only a small number of tasks. It may be that such farms have a lesser need for contractors than, say, a mixed farm, if they have smaller fields, little or no arable production and less need for silaging. Perhaps, too, they minimised their use of contractors for financial reasons. Some interviewees did refer to the expense of contractors, which must be weighed up against the speed and quality of contractors' work.

Additionally, some of the farms have more labour (and machinery) available in-house. This could apply to some of the LFA farms with substantial family labour, or to the 56 farms in the survey which ran a contracting business. Only 79% of the latter group used other contractors during the preceding 12 months for an average of 2.6 tasks, compared with 91% of the farms without a contracting business averaging 3.1 tasks. These respondents still used contractors for the most popular tasks, silaging and baling, but were less likely than other farms to use contractors for drilling, sowing, planting and hedge work. A review for Defra concluded that many small farms with family labour in England "choose to do non-urgent activities themselves, particularly when the equipment required is not particularly complex" (Langton, 2014:14).

A simple grouping of the workforces with and without contractors by farm type is shown in Figure 7.10. It highlights the stark differences in how the farms sourced their labour, with the greatest contrast between dairy farms (strong reliance on both non-family labour and contractors) and LFA farms (greater self-sufficiency within the core workforce). The findings add to the evidence that farming a large area, being eco-extensive, having a diversification business and doing direct sales are often linked with having a relatively large and diverse workforce, as is having a dairy or mixed farm. In contrast, running a grazing livestock-only operation typically means fewer people, a lower FTE per farm and less use of contractors or non-family workers – even if the operation involves labour-intensive indoor lambing.

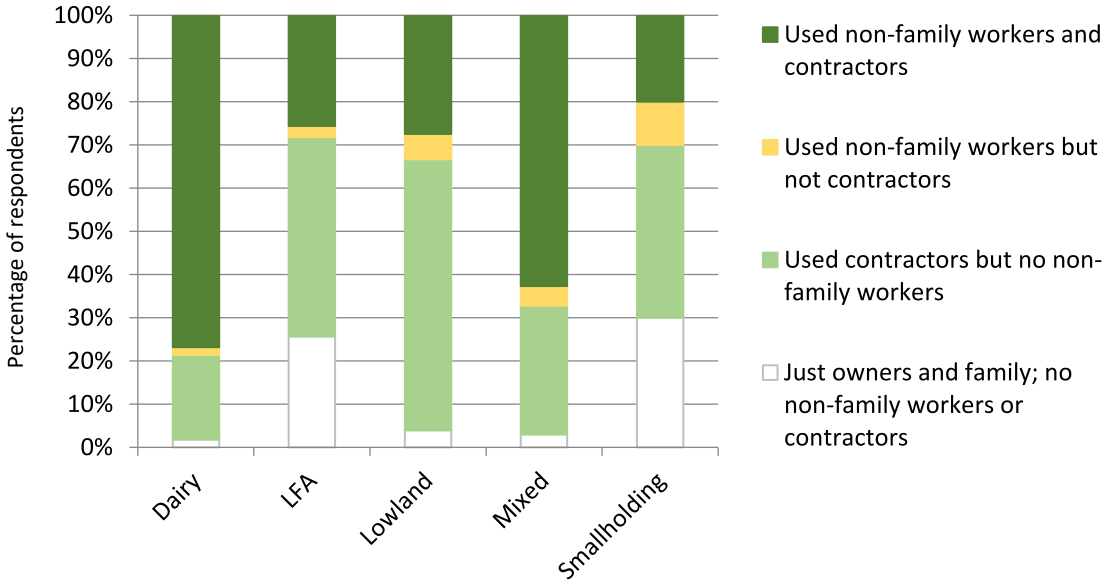


Figure 7.10. Percentage of survey respondents in each farm type whose farm had one of four workforce types
Data source: survey dataset

7.3.3 Workforce diversity

Related to the make-up of the farm workforce is its *diversity*, meaning how many types of worker are included. On average, the farms in the survey sourced labour from 3.8 of the seven categories over 12 months. The farms that tended to source from the most categories were dairy farms (average 4.5 sources), farms with at least 200ha (4.4), farms with a non-farm diversification enterprise (4.2) and mixed farms (4.1). These farms are also associated with large workforces by number of people or estimated FTE, and through this they gained workforce diversity and points of connection. Farms that tended to have used a narrower range of labour sources included smallholdings (average 2.2 labour sources), other small farms under 50ha (3.2), LFA farms (3.1) and lowland farms (3.2). These farms were more self-sufficient, with greater reliance on a small core workforce. Whereas 30% of the dairy farms and 27% of the mixed farms had used non-family workers, contractors and informal help in the preceding 12 months, this applied to only 10% of the lowland and 5% of the LFA farms.

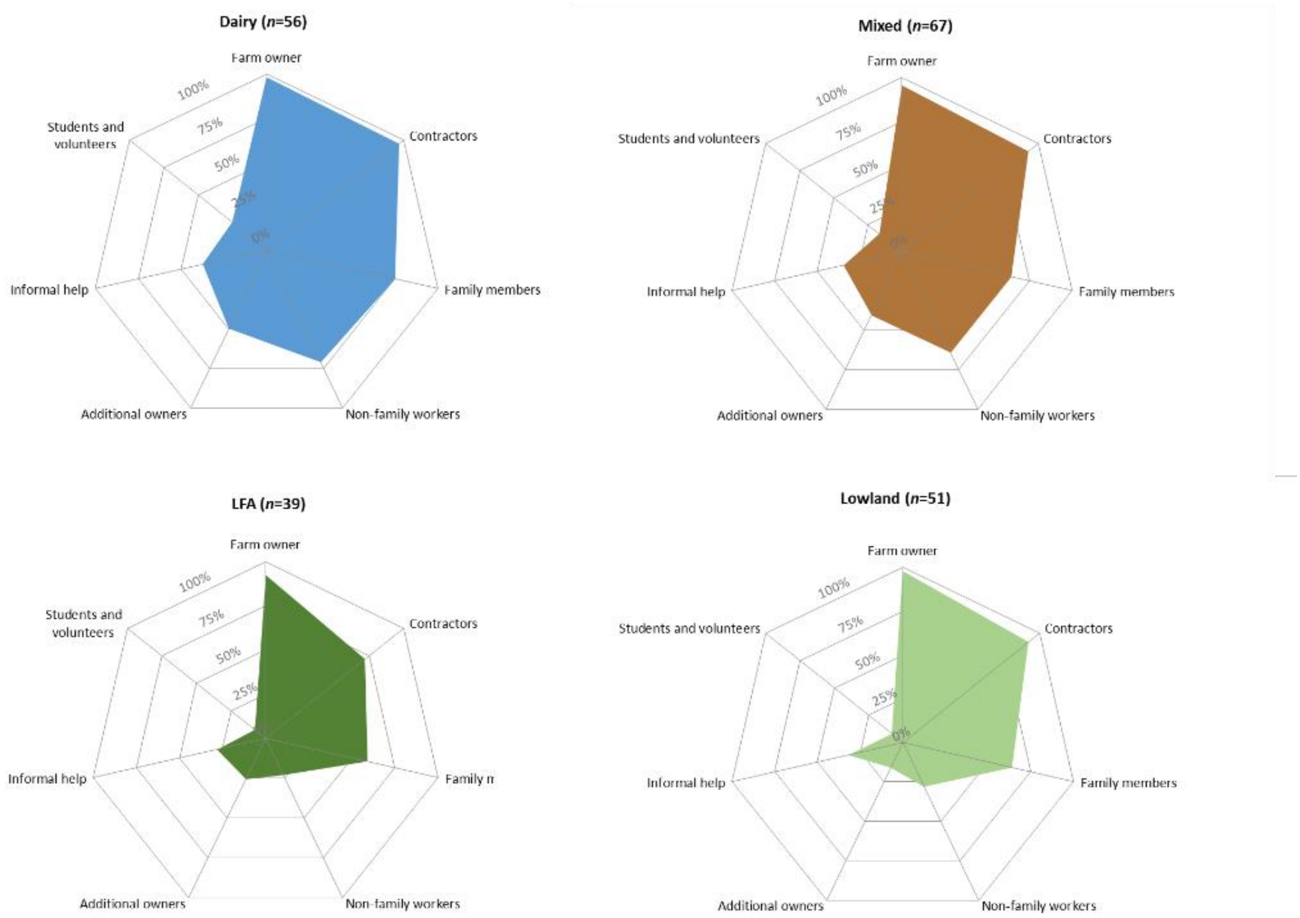


Figure 7.11. Percentage of survey respondents whose farms used each labour source in the past 12 months, by farm type
Data source: survey dataset

The variation in workforce diversity is illustrated in the radar charts (Figure 7.11). They show the percentage of farms that sourced labour from each of the seven categories in the previous 12 months. The average dairy and mixed farm in the survey had a larger labour network than the average LFA and lowland farm, mainly because they were more likely to have sourced non-family paid labour but also because they used less common sources such as students and volunteers.

Partly it is the more labour-intensive production systems of dairying and mixed farming that probably drove those farms to have larger and more diverse workforces. Eco-extensive operations and farms with diversified enterprises were also likely to have sourced labour from a wider range. Figure 7.12 shows that such farms may have more co-owners or business partners in the core workforce and may be more connected to other farmers who provide informal help.

Figure 7.12 Percentage of survey respondents whose farms used each labour source in the past 12 months, by nature of farm business (*n*=222)
Data source: survey dataset

Another way to conceptualise workforce diversity is to consider how many people from different labour sources are in the farm's orbit. This affects the farm's 'connectedness', an idea discussed in Chapter 10. Figure 7.13 depicts the workforce orbit of the average farm in the survey, taking the average number of people in each of the seven worker categories who worked on the farm in the previous 12 months. The questionnaire did not capture how many individual people were involved when a respondent said they got help from a contractor or informal help, and these two worker categories are both recorded as a single person and are therefore probably under-represented in the diagram. It reflects that the average farm drew on 1.1 family members and 1.8 non-family workers (not including 0.3 students and volunteers) during the year.

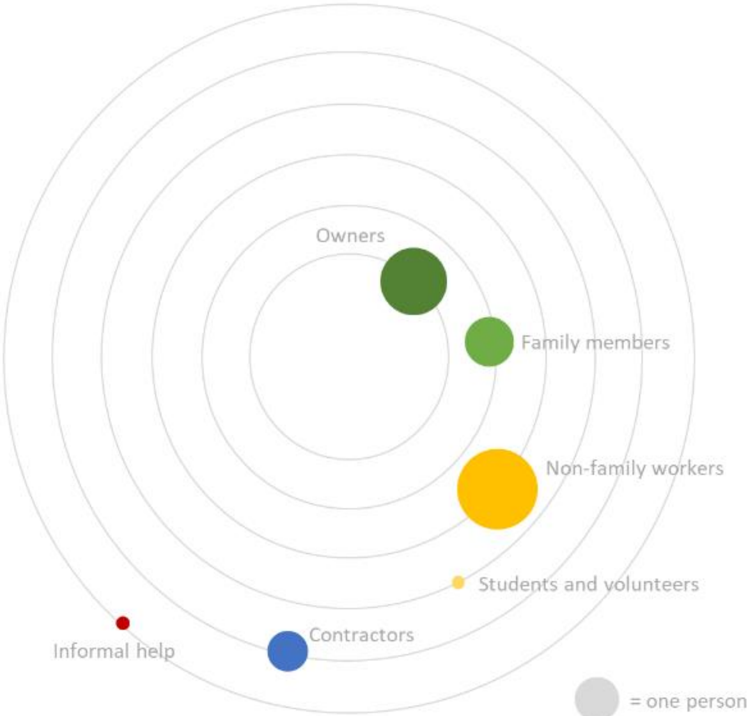


Figure 7.13. Workforce connections of the average farm from the survey (*n*=215)
Data source: survey dataset

Based on the number of people from each labour category who worked in the average farm workforce during the preceding 12 months. Excludes two outliers and 13 respondents who did not answer all of the relevant questions.
Note: If a respondent used contractors and informal help, it is not known how many individual people were involved, and so 'contractor' and 'informal help' were both recorded as a single person and therefore are probably under-represented in the diagram.

The average dairy farm in the survey had more people in its 'orbit' than a lowland farm, particularly non-family workers, although not necessarily a more diverse workforce by number of types of worker (Figure 7.14). However, some respondents' farms had very small workforces that drew labour-input from only two or three sources. Respondent 20 provides an example of this. In the past 12 months, only she and her husband had worked on their mixed beef and arable farm, plus one or more contractors. A contrasting example of a large and diverse workload comes from Respondent 432. His mixed sheep and pig business had also used contractors in the previous

12 months, but in addition, the workforce had drawn from two family members, four non-family workers, four students and an unknown number of other farmers who provided informal help. The next two chapters consider how these workforce variations affect the capacity of a farm to cope with external requirements and workload pressures in general.

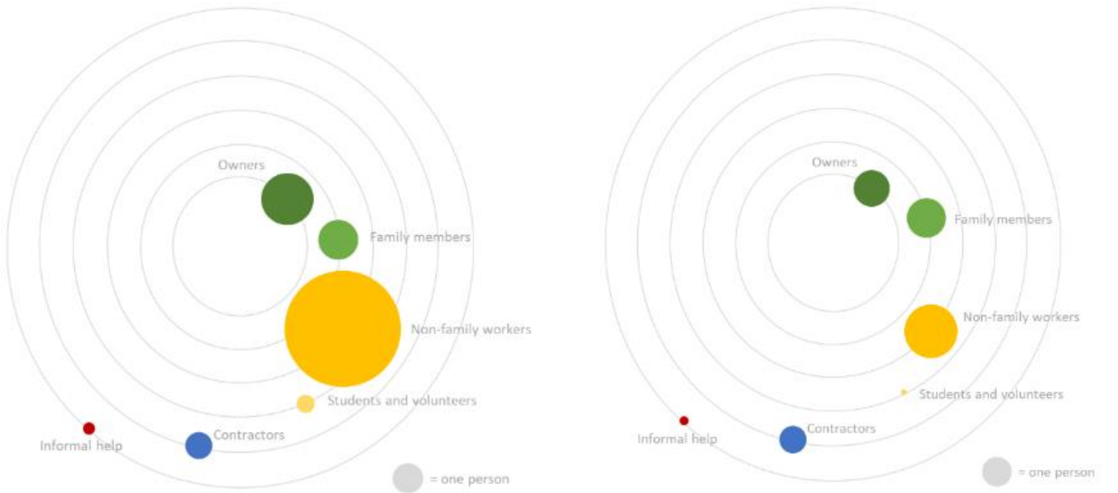


Figure 7.14. Workforce connections of the average dairy farm (left) and lowland farm (left) from the survey Data source: survey dataset

Figure 7.15. The workforce orbits of Respondent 20 (left) and Respondent 432 (right)
Data source: survey dataset

8. How are external requirements affecting farm workloads?

This chapter takes a look at how requirement schemes and other external requirements are affecting the workloads of the livestock farms in the study, addressing Research Question 2. It combines relevant information collected from the survey (which is summarised in Appendix 10) with findings from the interviews. The chapter begins by laying out which schemes the respondents' farms are participating in.

8.1 Participation in requirement schemes

8.1.1. Farm assurance and certification

The largest number of requirement schemes in the compliance landscape mapped out in Figure 5.1 of Chapter 5 are third-party farm assurance and certification schemes. By far the most common farm assurance and certification scheme among the farms in the questionnaire survey is Red Tractor or the Welsh equivalent, FAWL, which most of the surveyed farms (n=190, 83%) were assured against. They include all but one of the farms with a dairy enterprise, 88% of the mixed farms without dairy cattle, 79% of beef and sheep farms and 75% of beef-only farms, but only 35% of sheep-only farms. Of the 13 sheep-only farms that are not Red Tractor or FAWL assured, five are smallholdings, seven are lowland farms and one is an LFA farm.

Other farm assurance and certification schemes were much less common (Table 8.1). Thirty-seven respondents were certified against a UK organic scheme, and 34 participated in a supermarket or processor scheme.

On average, each farm in the survey participated in 1.2 farm assurance and certification schemes. The highest number of schemes reported by any farm in the survey is 6, and the lowest number is 0. Dairy farms participate in the most schemes on average (1.7 schemes per farm), followed by mixed farms (1.4). Livestock grazing farms tend to participate in fewer schemes (average 1.1 for LFA and 1.0 for lowland). Eco-extensive farms average a high number of 2.5 farm assurance and certification schemes per farm; unsurprisingly, since certification against an eco-extensive scheme is what defines them. If we exclude them and consider only non-eco-extensive farms, the positive correlation between number of farm assurance and certification schemes and dairy farms is statistically significant (p=0.003), as is the negative correlation with non-eco-extensive lowland (p=0.000) and LFA (p=0.028) grazing livestock farms. A farm's size in farmed area is also positively correlated with the number of farm assurance and certification schemes that the farm is participating in (p=0.000). See section 3.3.4.3 for an explanation of the statistics used to test these correlations.

Table 8.1. Survey respondents' participation in farm assurance and certification schemes (*n*=220)
Data source: survey dataset

	Red Tractor[a]	Super-market or processor scheme	UK organic[b]	Pasture For Life	LEAF	NOP	RSPCA Assured	Other	None or no answer
All farms	190 86%	34 15%	37 17%	9 4%	4 2%	2 1%	2 1%	12 5%	33 15%
Dairy	57 98%	22 38%	10 17%	0 0%	2 3%	2 3%	0 0%	1 2%	0 0%
LFA	32 83%	4 10%	5 13%	0 0%	0 0%	0 0%	0 0%	7 18%	5 13%
Lowland	37 70%	1 2%	8 15%	3 6%	0 0%	0 0%	0 0%	2 4%	14 26%
Mixed	64 91%	7 10%	14 20%	6 9%	2 3%	0 0%	2 3%	2 3%	4 6%
Cattle only	72 92%	16 21%	20 26%	4 5%	2 3%	2 3%	1 1%	1 1%	4 5%
Sheep only	17 57%	1 4%	2 7%	0 0%	0 0%	0 0%	1 4%	3 11%	17 61%
Cattle and sheep	101 89%	17 15%	15 13%	5 4%	2 2%	0 0%	0 0%	8 7%	12 11%

[a] Or FAWL in Wales. [b] UK organic schemes includes OF&G and Soil Association.
NOP = United States National Organic Program.
Smallholdings are excluded because by definition, none is in a scheme.

The most common situation is just to participate in Red Tractor or FAWL, which applies to 42% of farms in the survey. This rules out eco-extensive farms, but it is significant among non-eco-extensive LFA grazing livestock farms (p=0.001) and mixed farms (p=0.019). A further 40% of respondents participate in one or more schemes in addition to Red Tractor or FAWL. For example, 22 (38%) of dairy respondents participated in supermarket or processor schemes such as Arlagarden, Tesco's scheme for dairy suppliers or the Cooperative scheme for milk purchased via Mueller.

The data suggest that the more marketing channels a farm sells into, the more farm assurance and certification schemes it participates in. There is a significant positive relationship between number of schemes and number of marketing channels both for livestock (p=0.015) and for all farm produce, using the incomplete marketing information from the survey (p=0.000). The farms that sell to a supermarket or processor are highly likely to be participating in an additional scheme to Red Tractor or FAWL, such as a requirement scheme of that buyer.

Only 33 farms (14%) participated in no farm assurance or certification schemes at all. Aside from the smallholdings, this was most likely to be a non-eco-extensive lowland farm (p=0.000). The farms without any farm assurance or certification have a small average farmed area of 55ha and typically just do direct sales and/or sell to a market, wholesaler, trader or agent (88%, n=29 of 33). We might expect that farms selling direct to customers would not need farm assurance. However, most of the farms that reported direct selling have some form of certification (80%, n=48 of 60). This may be because they sell livestock through auctions which require Red Tractor certification, or because they combine direct meat, milk or produce sales with another route to market. But even among the seven farms for which direct selling is their only marketing channel, all but one are still certified either Red Tractor or Pasture For Life.

8.1.2. Stewardship

Compared with farm assurance and certification, a smaller number of farms (n=127, 55%) are participating in government schemes such as Countryside Stewardship, the older English scheme Environmental Stewardship or Glastir in Wales. Stewardship schemes are common among mixed farms (74%), but less so among lowland (57%), dairy (48%) and LFA farms (44%). None of the smallholdings is in a stewardship scheme. Of the 38 survey respondents who said they had organic certification, 34 said they were also in a stewardship scheme. That is, most of the organic-certified farmers were also taking advantage of the organic payments available through stewardship.

When stewardship is added, the average number of schemes per farm rises to 1.8. Participating in a government stewardship scheme is positively associated with mixed farms (p=0.000), being eco-extensive (p=0.000) and larger farms by farmed area (p=0.000).

Figure 8.1 shows how requirement schemes and other external demands can pile up for certain farms, depending on the type of livestock they keep, the voluntary schemes they participate in and the market channels they sell into. A sheep farmer who is not in a Red Tractor scheme and sells mostly through livestock auctions faces relatively few external requirements, although they must comply with livestock record-keeping and Cross Compliance rules if they want a Basic Payment. Farmers with cattle face the additional burden of TB testing if they are in a TB risk zone. Participating in organic and/or stewardship schemes will also add requirements. The dairy farmers in the survey were often participating in the most schemes, since Red Tractor is effectively mandatory and additional sustainability standards from buyers such as Arla or First Milk may be required. Dairy farms also face statutory requirements around milk safety and buyers' demands on milk quality, as discussed in Chapter 5.

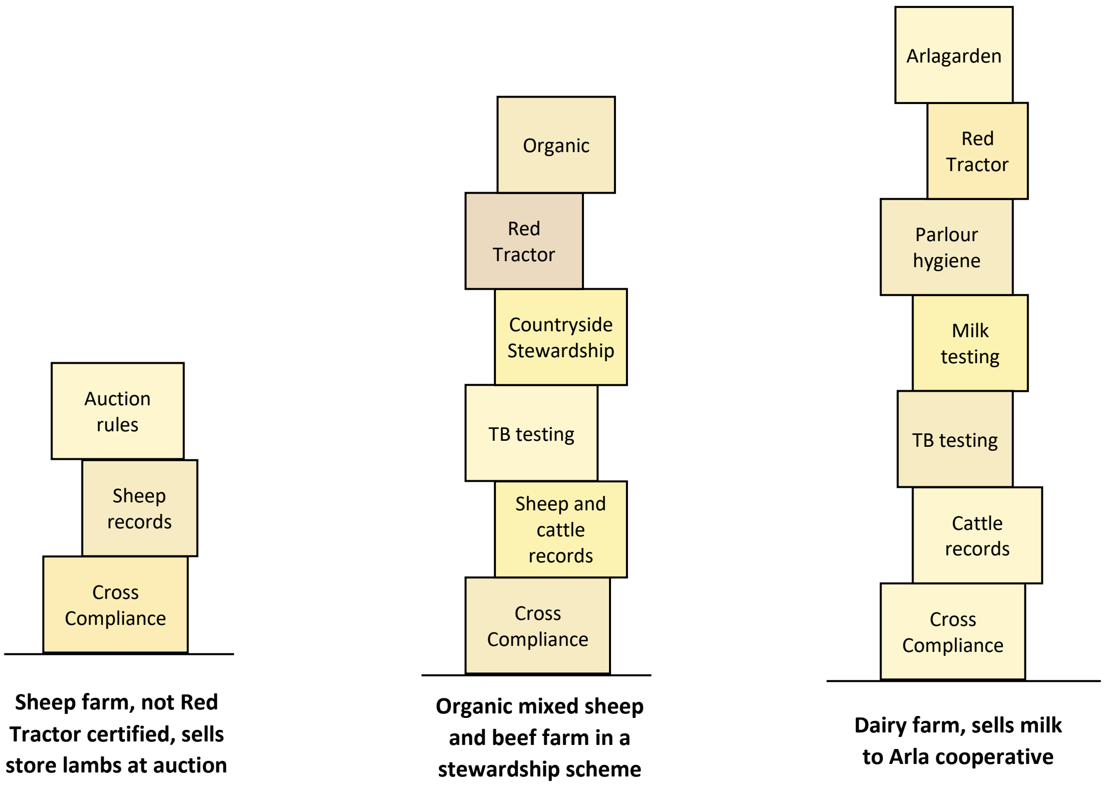


Figure 8.1. How external requirements can pile up for three illustrative livestock farms
Created by author

8.2 Effects on operational work

One of the objectives of this study is to assess if and how external requirements are affecting farm workloads. The assessment presented here is based on respondents' descriptions of their work and their observations of what takes time, and thus is qualitative and subjective. It is also likely to be strongly influenced by which member of the farm workforce was surveyed or interviewed.

The first possible area of impact of external requirements is operational work (Ehlert et al., 2014) – that is, work done in the field or with animals, machinery and infrastructure. In the main, interview respondents did not express feeling overly constrained by external requirements in how they farm. When asked if there were certain practices that they found difficult to carry out, interviewees struggled to answer. Possibly, some respondents did not want to admit non-compliance with external rules. Chapter 5.6 revealed that operational non-compliances are common. However, it seemed that most farmers have simply accepted and internalised many of the rules by which they have to farm in the UK. One could conclude that the most likely effect of external requirements on operational work is that administration takes farmers' time away from farming. Nevertheless, the questionnaire survey and interviews did reveal some areas where external requirements are having an effect on operational farmwork and might even require greater labour capacity than the farm has available.

8.2.1 TB

From the interviews and questionnaire survey comments, it is clear that the legal requirements for controlling bovine TB are adding significant time – and pressure – for farms with cattle. One survey respondent wrote, "TB management [is] an ongoing cost, stress and concern." When asked about future demands on their time, three survey respondents said they were concerned about the continuation, and possible increase in frequency, of TB testing.

One aspect is the time needed for TB testing, which involves gathering cattle for the vet, helping to record results and housing isolated animals. Interviewees suggested the testing might take 2–5 hours, but the whole procedure of moving animals could take up to two days. If testing is not done in winter, cattle are likely to be out at pasture, which increases the time needed to gather them, but even Respondent 491, who used a mobile pen for testing in the field, described the time needed for setting up as "a major headache". Typically two or three people are needed, in addition to the vet. Therefore TB testing is another peak labour time in the farming calendar. It might occur only once every 6 or 12 months, but the frequency is increased if the farm (or a neighbouring farm) records positive or inconclusive results (see Chapter 5.1.1.1).

Another aspect is the consequences of a breakdown. Three respondents said they had downsized or given up rearing beef cattle after TB was found, which led to a decrease in their workload. However, other respondents described an increase in workload from rebuilding their herd after TB losses. Often, farmers choose to develop closed herds to avoid purchasing infected stock, and rearing calves takes time. Farmers may take other time-consuming biosecurity measures to prevent contamination, including keeping youngstock indoors for longer, housing animals at night or strengthening fencing. A study for Defra estimated the average cost of a TB breakdown to a farm in England and Wales as £23,636 with a median cost of £6,554, rising with herd size (Barnes et al., 2020). The calculations included labour needed for testing and housing isolated animals as well as other activities not mentioned by respondents such as disinfecting facilities.

8.2.2 Dairy calves

Chapters 2 and 5 documented the trend for milk buyers to outlaw the euthanasia of male dairy calves under eight weeks and to support better market coordination so that such calves can be reared and enter the beef supply chain. As yet, there appears to have been little academic research on the labour implications of such measures. Commenters on the UK Farming Forum give some insights into how it could add to the dairy farm's workload, such as these examples:

> "I'm all for not shooting calves and think it's got to be addressed, but I've quit rearing youngstock as it was putting workload and infrastructure under pressure, and with all

> bought-in goods to keep them wasn't economic. There is no way I'm going into rearing beef and losing money on them" (Happycows, 2019)

> "Luckily having British Frisian cows I have never had to euthanise a healthy calf, just the odd sick/not right ones, never a nice job, but you do the best for the animals in your care. What will bugger me up, the only way I can guarantee no calves of mine will get slaughtered until 8 weeks old, is to keep them home till their 8 weeks old, which will cost me a load more money and work for little or no return" (Dinderleat, 2019)

The questionnaire asked respondents how they thought adopting measures to avoid killing dairy calves would affect their workloads. Two-thirds of the dairy farmers who answered this question selected 'We already do this', and 12 (21%) selected 'Our workloads would increase' (Figure 8.2). However, none of the dairy farmers mentioned such measures when answering the separate question of whether they had recently made changes that had affected their workloads. One of the farmers who said he was already taking measures, Respondent 210, discussed the topic further in interview. He explained that Arla's new rule on rearing calves to eight weeks had caused him to increase staffing, because of the extra labour involved. There was no financial compensation for this – "unless you count the fact that we get to keep supplying Arla," he said – but the farmer was generally supportive of the policy. Respondent 189 had taken an alternative measure of using sexed semen. He did not want to get involved in rearing beef calves – they did not raise a high price at market and "it takes time away from my speciality, which is milking cows," he said. For him, it was matter of doing the right thing ethically but also keeping his business profitable.

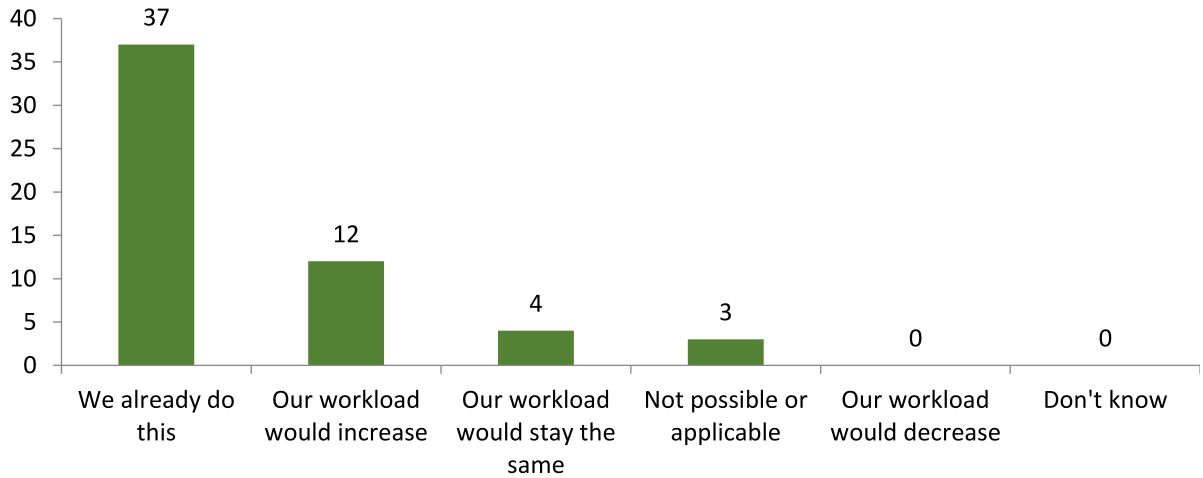


Figure 8.2. Dairy farmers' response to the question, If you adopted measures to avoid killing male dairy calves, how do you think it would affect your workload? (*n*=56)
Data source: survey dataset

8.2.3 Animal health and working with the vet

Several interviewees from all farm types said they were working more than before on aspects on animal health and welfare, often in conjunction with their vet. The interviews revealed increasing pressure on farmers to use fewer injections and prophylactic medication. This was changing the way some farmers looked after their livestock. Respondent 20, a mixed farmer from Herefordshire, explained that she and her husband had cut down on medication, because of Red Tractor, which she thought was a positive development but had increased the time that they needed to spend with calves. This topic is explored further in Policy Case Study 2.

Working more closely with their vet helps farmers to fulfil their Red Tractor requirements to develop a flock or herd health plan, which dairy farmers must have their vet sign off. Some farmers, particularly dairy farmers or those supplying supermarkets, took ownership of their health plans, like dairy farmer 213:

> Researcher: "Are there any things in your Red Tractor health plan, or anything else that you're asked to do, that you find it difficult to comply with?"
>
> Respondent 213: "No. I don't know how to say this without sounding big-headed… We are very proactive. We have a programme for IBR [infectious bovine rhinotracheitis], TB, BVD, herd health… After every calving, there is an inspection at three weeks and again before she [the cow] is put to breeding again. All this is done through our vet. We stick very closely to our herd health plan."
>
> Researcher: "So everything that you come up with in your health plan, is what you know you can accomplish?"
>
> Respondent 213: "Yes."

Others developed their plans begrudgingly or passively, like lowland Wiltshire farmer 491, who described the process as "a farce", or Herefordshire LFA farmer 109, who had mislaid his health plan. Some respondents value their vets' advice and liked the idea of more proactive livestock health management, but found some of the vets' recommendations too time-consuming to comply with, such as foot bathing for lameness since it requires gathering livestock. Small-scale dairy farmer 395 found it impractical to muck out the cattle sheds as often as his vet had suggested, and did not always have time to follow her advice to drench his sheep for a second time. Such farms may require greater labour capacity or a reallocation of labour to comply with external demands.

8.2.4 Field operations

A small number of interviewees commented on the field-operation demands of stewardship and organic schemes, such as the time needed to segregate organic and non-organic cattle, or improve the sustainability of the farm by covering muck heaps, redirecting water and planting hedges. The respondents did not suggest that these activities were unmanageable, however.

Possibly, interviewees did not highlight field operations as an area of difficulty because many field tasks are now done by agricultural contractors, and it may be these contractors who have to ensure that the timing and nature of their work and the standard of their machinery complies with external requirements. For example, Respondent 95, an LFA farmer from Herefordshire, said he and his wife did not do any crop spraying because of "rules and regulations" – a contractor did it, and they just filled in a record sheet. The Oxfordshire farm manager consulted during the scoping phase noted at the time that most of their Red Tractor requirements were met by their arable contractor. For example, pesticide storage was managed by the contractor, not at the farm (interview, 23 October 2018).

8.2.5 Red Tractor rules

With Red Tractor, some interviewees had been asked to make adjustments to infrastructure and equipment. One example is being asked to fix a metal door with a rip at the bottom; another, maintaining sprayer equipment. These requirements did not seem to be particularly time-consuming – rather, farmers were annoyed or bemused by their perceived triviality. Farmer's daughter Respondent 524 talked of "lots of funny little restrictions" with Red Tractor, adding, "I seem to spend most of my time arguing with my mother about why things aren't allowed." Respondent 73, a lowland farmer from Herefordshire, said:

> "Why do they need to know how often I worm my dogs? It's pointless. The new rules are just crazy. They asked me about rodent control – I said, two cats. They said 'no, we need to know where you store your products'. Red Tractor is not doing what it's supposed to do – it's just making jobs for people."

Several farmers explained that their operational workloads had been largely unaffected by Red Tractor because their systems were already more advanced than the Red Tractor standards. They viewed Red Tractor as a good thing for the industry, but not necessarily impactful on their own production systems. Respondent 200, an organic dairy farmer said:

> "I think that Red Tractor is just another way of making sure that people are farming the right way. It stops people slipping through the net. If there weren't Red Tractor, there would be lots more animal welfare problems."

8.3 Effects on administrative work

The second area of farming where external requirements have an effect is administrative work (Ehlert et al., 2014). To assess this, survey respondents were asked to select the three areas of work that require the most paperwork. The sources of paperwork that were selected most often are: tax and accounts; farm assurance and certification; and livestock sales and breeding (Table 8.2). Respondents were then asked to elaborate on their responses during the phone interviews.

Table 8.2. Top sources of paperwork faced by surveyed farmers, as measured by number of respondents who selected the source as one of their three biggest sources of paperwork
Data source: survey dataset

Source of paperwork	Number of respondents	Percentage of respondents
Tax and accounts	179	79%
Farm assurance and certification	156	69%
Livestock sales and breeding	116	51%
Basic Payment Scheme	77	34%
Veterinary jobs	52	23%
Countryside Stewardship	38	17%
Marketing and customer management	19	8%
Diversification business	16	7%
Land matters, tenancies and planning	9	4%
Buyer schemes and contracts*	5	2%
Livestock movements, births, deaths and health records*	4	2%
Paying bills*	2	1%
Staff development*	1	0.4%
Machinery maintenance*	1	0.4%
Don’t know	3	1%
Total responses	226	100%
No answer	4	
Grand total	230	

Respondents could select more than one option.
* = category created after survey was administered, based on responses received under the ‘Something else’ category.

It was much easier to get interviewees to discuss how their time was affected in this area than operational work. During the interviews, this topic was broached as “paperwork”, but it became clear that far from being paper-based form-filling and record-keeping, administration associated with external requirements was a diverse area of work which also includes audits or inspections, phone calls and various types of data collection using technology to some extent. Information gathered from the questionnaires in addition to the interviews illuminates which aspects may require the most labour and which skills are needed. As with the assessment of the impacts on operational work, this analysis is based on respondents’ observations rather than quantitative measurements.

8.3.1 Tax and accounts

Tax and accounts was one of the largest sources of paperwork for most farmers in the survey. Particularly likely to name tax and accounts as one of their top three sources were respondents from farms with sheep but no cattle (92% of whom named tax and accounts as a top source, p=0.044), smallholdings (90%), farms that were not in any farm assurance or certification scheme (90%), farms with direct selling of livestock or non-livestock products (89%, p=0.034), LFA farms (85%) and lowland farms (84%). Two respondents also specified paying bills as a top source. The correlations that are statistically significant are shown in parentheses.

Interviewees explained that keeping up to date with farm business accounts was a regular task that had to be done, involving entering information into a leger or software programme, checking invoices and resolving any problems. Two interviewees highlighted VAT accounting as the most time-consuming aspect. Respondent 124, from a medium-sized LFA farm, said: "Most farmers will tell you, if you've been out working all day, it's the last thing you want to do."

The survey respondents who were less likely to select tax and accounts seem to be farmers for whom other sources of paperwork are even more burdensome, as will be shown below. They include farmers who sell livestock or other produce to a supermarket (only 61% of whom named tax and accounts as a top source, p=0.004), mixed farmers (74%), dairy farmers (75%) and farmers with both cattle and sheep (75%). Also the larger the farmed area and the more farm assurance and certification schemes that the farm participates in, the less likely it is that the farmer named tax and accounts as a top paperwork source.

8.3.2 Livestock sales, veterinary jobs, movements

The surveyed farmers faced substantial sources of paperwork that are specific to livestock farming: livestock sales and breeding, veterinary jobs and recording animal movements, births and deaths. This paperwork stems from a combination of statutory and voluntary requirements from a range of external sources including Cross Compliance, Red Tractor, breeding societies and livestock auction houses.

After tax and accounts and farm assurance and certification, livestock sales and breeding is the greatest source of paperwork facing livestock farms according to the survey respondents. It was selected by a high percentage of lowland (75%, p=0.001) and LFA (69%, p=0.014) farmers, but by only 39% of dairy farmers (significant negative correlation, p=0.038) and 36% of mixed farmers (p=0.003). Paperwork from veterinary jobs was selected by 23% of respondents. This was a particular concern for smallholders (36%) and dairy farmers (36%, p=0.009), and less so for LFA (28%), lowland (16%) and mixed (13%, p=0.018) farmers. Four survey respondents specified recording livestock births, deaths and movements as an additional top source of paperwork. They were all farmers with cattle: two dairy farmers, one mixed farmer with beef, sheep and arable, and one LFA farmer with beef and sheep.

During the interviews, these types of paperwork were often conflated by respondents, and the workload can clearly feel substantial and even overwhelming when the paperwork sources are taken together, but there are observable differences between them.

Paperwork associated with **veterinary jobs** refers to the requirement to record medications used during veterinary interventions and other medication applications such as drenches and dips. What interviewees find time-consuming is the need for every small thing to be recorded – not just the type of medication, but details such as the batch number and expiry date of the product. "Whatever is put into a cow is written down," as dairy farmer 32 put it. Veterinary paperwork was perhaps often selected by dairy farmers in the survey since they use medications more often because of housing cows and calves and the need to prevent mastitis, and because dairy farms are being asked to do more on disease prevention as identified in Chapter 5. Paperwork from veterinary jobs was named as a top source by 10 of the 17 respondents with dairy and beef enterprises that do some year-round housing (59%), which is a statistically significant correlation albeit from a small sample (p=0.001 using Fisher's Exact Test). The percentage was much lower among farms that outwinter all of their animals (32%), winter house their animals (18%) or use a combination of the two (21%). When it comes to sheep, veterinary paperwork was more likely to be selected by farms that have sheep but do no lambing (30%) than farms that do some or all outdoor lambing (25%) or all indoor lambing (23%). It is interesting that lambing is associated with less veterinary paperwork than not lambing. Perhaps this is related to the types of veterinary jobs that are needed for sheep finishing enterprises, or another factor may be in play.

Livestock sales and breeding generates paperwork because of the need to produce certificates, licences and animal records for buyers, such as livestock markets or other farmers. Farmers must follow statutory rules when moving livestock on and off a holding, and inform the relevant body. It may be that paperwork from livestock sales and breeding is particularly heavy for farmers who buy and sell large numbers of livestock throughout the year. Figures from the English FBS in 2018/19 suggest that, on average, LFA farms sell more sheep than other farm types, and they also spend more on sheep purchases, though that does not necessarily translate to animal numbers (Table 8.3). Although they were less active than other farm types when it comes to cattle sales, perhaps the high level of sheep activity helps to explain why 69% of the LFA respondents in the survey named livestock sales and breeding as a top three source of paperwork.

Table 8.3. Average numbers, purchases and sales of cattle and sheep, England, 2018/19
Data source: Farm Business Survey (RBR, 2021). Excludes farms with Standard Output below EUR 25,000

Average per farm	Dairy	LFA	Lowland	Mixed	Average
Cattle purchases (£)	£13,587	£8,942	£19,911	£22,431	£16,218
Cattle sales (£)	£69,016	£35,450	£63,728	£66,339	£58,633
Cattle sold	165	39	59	65	82
Average cattle over the year	359	83	111	104	164
% cattle sold	46%	47%	53%	63%	50%
Sheep purchases (£)	£1,306	£6,212	£2,828	£4,306	£3,663
Sheep sales (£)	£4,642	£40,798	£19,838	£20,382	£21,415
Sheep sold	61	559	247	253	280
Average sheep over the year	67	752	312	289	355
% sheep sold	90%	74%	79%	87%	79%

With the other farm types the connection is less clear. One influential factor could be membership of a **breeding society**. Five interviewees raised this when asked about their administrative workloads. Breeders must register animals with the society and may need to conduct DNA tests or blood tests, or affix special ear tags to pedigree livestock.

Recording **livestock births, deaths and movements** is a substantial task in its own right, as revealed during interviews. It can be especially time-consuming for farmers who move livestock frequently or farmers in the Welsh borders whose farm straddles two countries, such as Respondent 109 in Herefordshire, who described bureaucratic difficulties from Wales having different requirements for sheep records than England.

Overall, this category presents a mix of routine record-keeping that can be done on paper if preferred, and more diverse and peaky administrative work around sales time. Most farms will have a medicine book and a movements book (Figure 8.3); farmers also carry a notebook or smartphone for making notes on the fly, which can be transferred to the medicine or movements book later, perhaps at a regular time every evening or every week. For example, Respondent 52 uses a day book to record medical treatments day to day, "because we're with Red Tractor", then once a month checks against her partner's movement book, where he keeps a record of any livestock movements. There is a legal requirement to record animal movements within three days, which creates motivation for regular record-keeping. As with tax and accounts, many farmers seem to find the routine work less stressful – albeit time-consuming – than the work that is either peaky or computer-based.

Respondent 20 expressed frustration that there was no system for compiling cattle data such as TB status more efficiently and that EID tags and software, which had promised to provide such a system, did not work properly. However, using EID tags worked well for dairy farmer 364 as way to share data with his vet during TB testing, and for mixed farmer 389 to record cattle weights. Also, sheep EID tags were praised by Respondent 95 as a way for the auction house to quickly access data about livestock he was selling at market, although Respondent 124 said that tags were easily dislodged and lost, and so he often deliberately left lambs untagged until shortly before market day.

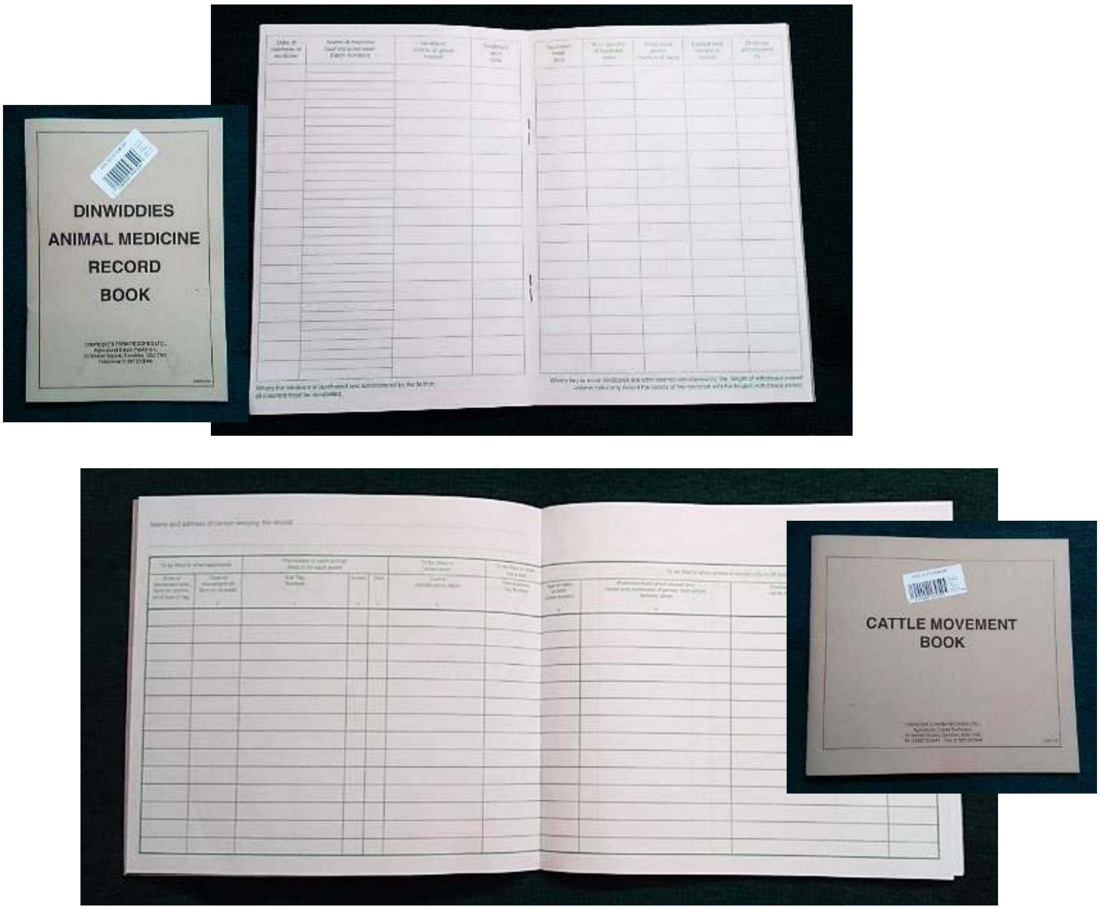


Figure 8.3. Blank medicine and movement books used by farmers
Source: author

8.3.3 Farm assurance, certification and buyer schemes

This section covers the paperwork generated by farm assurance and certification schemes. There is some overlap with the previous section, as regards record-keeping of livestock medications. This section deals with the administrative work involved in complying with third-party standards in all areas, not just livestock health, and in preparing for and participating in private-sector inspections and audits.

The survey and interviews suggest that external schemes in the form of farm assurance and certification are among the largest sources of administrative work on most livestock farms. Given the high participation of dairy farms in external requirement schemes, it is perhaps not surprising that 88% of all dairy farmers named farm assurance and certification among their top three sources of paperwork (p=0.001). It was also selected by 81% of all mixed farmers in the survey (p=0.009). The percentage is lower for lowland farmers (57%, a significant negative association of p=0.033) and LFA farmers (54%, a significant negative association of p=0.024).

Red Tractor

During the interviews, most of the comments on scheme paperwork concerned Red Tractor (or FAWL), against which almost all (91%) of interviewee farms were assured against. It required them to record a wide range of information; not only the livestock medication records discussed above, but also information such as when and where fertiliser and farmyard manure were applied (Respondent 247). Respondent 20, who was one of the interviewees who struggled most with paperwork, said: “It is just a nightmare. It’s a bit like working for a huge firm where you have to have every document filed and every procedure carried out.” Much of this information was recorded throughout the year, particularly if farmers make an effort to do so. But the notable characteristic of Red Tractor paperwork is the need for a large volume of documents and information to be collated in a shorter space of time ahead of the annual or 18-monthly inspection. This makes the work more peaky and potentially stressful.

Interviewees highlighted the plans that they were asked to present to the inspector, such as the herd or flock health plans mentioned above, or nutrient management plans. Preparing these plans and downloading forms adds to the time. One interviewee described the difficulty she had in finding a farm map for the required pest control plan. It can even be time-consuming to identify what information is needed, which must surely increase the risk of non-compliances.

> “I probably shouldn’t admit this, but I don’t always read everything that Red Tractor send me. It takes a lot of time” (Respondent 53)

Eco-extensive schemes

The main certification schemes other than Red Tractor represented among the interviewees were eco-extensive schemes, namely organic schemes and the Pasture For Life standard. The comments from interviewees suggest that these are not so time-consuming, and this is supported by the survey data. Eighty-two per cent of farmers who are Red Tractor or FAWL certified selected farm assurance and certification as one of their top three sources of paperwork; a strong association (p=0.000). However, the percentage is lower for farms certified against an eco-extensive standard (76%).

This could be because eco-extensive certification systems require less administrative work. There is a small amount of evidence from the interviews to support this. Respondent 200, an organic dairy farmer, said of the organic requirements: “We’re well established [as organic]. At this point, in some ways it’s mostly a case of collating information. There is not much new stuff to be done.” Asked about his experience of Pasture For Life certification, Respondent 389 said he saw it as an “add-on” to Red Tractor which focused more on his ways of working than requesting additional pieces of paperwork. In contrast, several farmers noted new requirements under Red Tractor, such as the livestock health plans. When asked his opinion on Red Tractor paperwork, LFA farmer 109 said: “Well, they keep moving the goalposts, they keep adding things.” Furthermore, eco-extensive farmers may find Red Tractor less burdensome and stressful than conventional farmers do as a result of having developed better record-keeping and control systems for organic conversion, and perhaps being more computer-literate (Lobley et al., 2006).

It could also be a reflection of the fact that eco-extensive schemes are voluntary and offer financial returns through organic payments or premiums, whereas Red Tractor is seen as a quasi-compulsory standard with sometimes questionable financial value. Much of the frustration over Red Tractor paperwork related to a sense of farmers’ time being wasted, and in some cases, needless cost – a perception of farmers needing to spend time and money preparing documents simply for the inspector to sign. Respondent 297, for example, described paying £400 for external advisers to help develop his manure management plan, which the Red Tractor inspector checked off without reading. Others mentioned the additional cost of paying for their vet to review and sign the health plan. The logic of farm assurance is that the very act of developing plans helps to raise standards, but clearly some farmers resent this external persuasion. This supports observations made by Sibley (2006) and Escobar and Demeritt (2016) that many dairy farmers did not see the management value of preparing plans that were required of them by external actors for compliance purposes.

Buyer schemes

Respondents who sell livestock or other produce to a supermarket were highly likely to name farm assurance and certification as a top source of paperwork (88%, p=0.011), and this rises to 91% of respondents in a supermarket’s or processor’s farm assurance scheme (91%, p=0.003).

Three of the dairy interviewees and one sheep farmer described some of the additional administrative work that being a supermarket supplier involves. Much of the work concerns collecting data on animal performance and health. Compared with Red Tractor or organic certification, the work was less peaky and more routine, being driven by quarterly or monthly reporting deadlines set by the buyers. Nevertheless, it poses a significant burden. Two farmers were on Cost of Production contracts, and this required them to record highly detailed information about farm business expenditure. Dairy farmer 181 from Shropshire sold to a large milk processor rather than a supermarket. He had a wide-ranging herd health plan and struggled to carry out all the tasks therein, including finding the time to set up weighing scales and regularly weigh his cows to help monitor for disease.

8.3.4 Other sources

The survey and interviews found that **AES** schemes are not typically not the greatest source of administrative work, as a rule, but that (a) the paperwork can be time-consuming at certain points, especially at the application stage; (b) some farmers find the detailed prescriptions and external control of stewardship more burdensome than others; and (c) when things go wrong, for example with payment delays, it can become stressful. Of the 126 farmers who were in a stewardship scheme, 29% named stewardship as one of their top three sources. This is much lower than the percentage of people in Red Tractor/FAWL or a supermarket or processor's scheme who named farm assurance and certification as a top source (82% and 91%, respectively).

The respondents who were most likely to name the **BPS** as a top source of paperwork were mixed farmers (45%, a significant positive correlation of p=0.018) and LFA farmers (41%). There is a negative relationship between a respondent selecting BPS and the number of farm assurance and certification schemes that their farm was participating in, suggesting that BPS paperwork is overshadowed by paperwork from third-party schemes. This could explain why only 16% of dairy farmers selected the BPS among their top three paperwork sources (a significant negative correlation of p=0.001). As with stewardship schemes, the application stage could be time-consuming, but it mostly became stressful only if something went wrong. Respondent 200, one of the few dairy farmers who selected this, had experienced payment delays and said BPS and stewardship administrative work made her anxious. "The RPA side of things brings me out in a cold sweat," she said. Respondent 243, an LFA farmer, thought that stewardship administration and Basic Payment delays had led to her farm's paperwork increasing. "You spend a lot of time just chasing things up," she explained. Respondent 109 had spent considerable time disputing a penalty amount being taken from his farm's Basic Payment over a confusion with TB cattle tags. "And they wonder why stress in agriculture is through the roof," he said.

Of the 78 respondents with a diversification enterprise, only 21% named **diversification** in their top three paperwork sources. This suggests that diversification does not generate as much paperwork as other sources – at least in aggregate, without knowing the types of enterprise that each farm had. However, farms with diversification were quite likely to name **tax and accounts** as a top paperwork source (82%), which is slightly more than farms without diversification

(78%). Respondents who had a diversification enterprise were also more likely than other farmers to name **marketing and customer management** as a top source of paperwork, as were respondents who did direct selling.

Land matters, tenancies and planning was selected by only nine respondents as a top source of paperwork. They were a combination of dairy, mixed and lowland grazing livestock farms, and at least two were tenant farmers.[14]

8.4 Handling administrative demands

The final section of this chapter considers how paperwork as a distinct aspect of livestock farming has been changing and how farmers are coping with it specifically. The reason for focusing on the administrative aspect of external requirements is that it emerged from the study as a relatively cohesive and cross-cutting area of farmwork. Operational impacts linked to external requirements are more disparate, and more time would be needed to study the time and labour effects of particular schemes' operational requirements, be it an environmental scheme, a welfare-focused scheme, and so on. Instead, examples of operational impacts are used to discuss how livestock farmers manage workloads in general in Chapter 9, and two particular areas of operational work linked to external schemes are explored as policy case studies in Chapter 11.

8.4.1 Changes in administrative work

Most survey respondents (60%) thought the amount of paperwork had increased over the past 2–3 years. Around two in five (39%) said it was about the same. Respondent 213 perceived that the farm paperwork done by his son and daughter-in-law had increased since he and his wife did the paperwork, but he thought it had become less onerous and more efficient, thanks to smartphones and computers and more targeted requirements. In contrast, organic farmer 243 thought paperwork had not increased in quantity but was becoming more complex, and the combination of some administrative work needing to be paper-based and some requiring technology was making it more time-consuming. One survey respondent who selected the BPS and stewardship among their top sources of paperwork wrote: "[Paperwork has] become more complex, and RPA [are] unavailable to help problem-solve."

The proliferation of rules and schemes mapped out in Chapter 5 is creating some duplication for livestock farmers, particularly farmers participating in multiple routes to market such as dairy farmer 404, who was asked to provide the same information to Red Tractor, her milk buyer and the supermarket with which she had an aligned contract. However, organic farmers noted with

[14] As explained in Chapter 7, the number of tenant farmers in the survey may be under-counted.

appreciation that their organic inspections could now take place on the same day as their Red Tractor audits, which saved them time and money.

There has also been a widening of the kinds of administrative work involved. Farmers still record information in paper notebooks, keep paper-based accounts and post forms to government departments, but they also described notifying authorities online via government gateways, downloading documents and uploading data. Dairy farmers were called to carry out forms of data collection such as body condition scoring or weighing animals that combine desk-based paperwork with operational farmwork.

Nearly half of the farms in the survey (45%) had received an inspection in the past 12 months, but the average number of inspections is 1.5 as some farms received more. The most received in a year by a single farm was eight. Twenty-eight farms received no inspection at all, however, including seven of the smallholdings.

During the Coronavirus lockdowns of 2020, on-farm inspections were suspended and certification bodies conducted remote audits instead, whereby farmers uploaded documents online and used smartphones to show inspectors around the farm. In June 2020, representatives from LEAF and SAI Global expressed satisfaction with the transition to remote auditing and suggested that certain aspects would be kept after lockdown (Land Management 2.0, 2020). The chief executive of Red Tractor, Jim Moseley, suggested that online uploading and remote audits for some farmers would continue (Clarke, 2020).

Interviewees held diverse opinions on this, influenced by their familiarity with software and the speed of their internet connection. Dairy farmer 364 found his remote Red Tractor audit a positive experience, uploading documents and receiving feedback as he went along: “It took some of the pressure off because it was spread over a week to 10 days.” Another computer-literate farmer, Respondent 189, hoped that having an online platform would allow him to upload information throughout the year in future, and thus make the work less peaky. Other interviewees found it preferable and less time-consuming to meet the inspector face to face and avoid the necessity of using new software and uploading such a large volume of documents.

8.4.2 Susceptibility

Farms vary in the extent to which they are affected by paperwork or administrative requirements more broadly. The survey and interviews show that it is not necessarily small, low-income farms that are the most affected. For such farms, especially when they have sheep but not cattle, tax and accounts are the major concern. They are often participating in marketing channels which do not require multiple farm assurance or certification, or which do not seem to generate much paperwork, such as direct selling. As farms get larger, farm assurance and certification become a bigger source of paperwork. Thus, it is often the larger farms which are participating in multiple marketing channels and requirement schemes that are subject to the greatest administrative demands.

In the survey, the respondents that were most likely to say that paperwork has increased over the past 2–3 years were dairy farmers (p=0.000), Red Tractor or FAWL assured-farmers (p=0.000) and farmers in a stewardship scheme (p=0.046). Selling livestock or other farm produce to a supermarket has a positive correlation tending to significance (p=0.069). Several of the farmers who had recently increased their workloads by business expansion had also experienced an increased level of paperwork (p=0.023).

In the questionnaire, around one-third (36%) of respondents said they thought the current level paperwork is excessive. This gives an indication of which kinds of farm are most affected by administrative demands. Dairy farmers were most likely to say that paperwork is excessive (48% of such respondents), compared with 38% of respondents from mixed farms, 36% from LFA farms, 25% from lowland farms and only 10% of smallholders (Table 8.4). There is a significant positive correlation between finding paperwork to be excessive and the number of inspections received in the past 12 months (p=0.000), being Red Tractor or FAWL assured (p=0.003) and the total number of farm assurance and certification schemes that a farm participates in (p=0.014). Farmers that have sheep but no cattle were unlikely to answer that paperwork was excessive (only 19% of such respondents), a negative correlation which is statistically significant (p=0.035). This could be related to statutory requirements in relation to cattle, to the higher number of farm assurance and buyer requirement schemes that farms with cattle – especially dairy farms – were participating in, or to the smaller average size of the sheep-only farms in the survey.

There is a cumulative effect whereby the more schemes a farm participates in, the more inspections they undergo (p=0.000) and the more likely they are to say that paperwork has increased (p=0.005). Respondent 20 described how the combined demands of Red Tractor, TB testing, Countryside Stewardship and their Environment Officer had become “overwhelming”. In the questionnaire survey, respondent 361 wrote:

> “I am constantly looking over my shoulder: TB, farm assurance, Environment Agency, cell counts, Bactoscan, public perception. Thank God I may be able to retire next year."

Interviewees who seemed least affected or stressed by paperwork were often farmers of small or single-enterprise farms. An example is Respondent 124 in Herefordshire, whose upland sheep and beef farm was below the threshold for reporting VAT online, was not member of a pedigree breeding society and was not Red Tractor assured. Another, lowland farmer 386 from Wiltshire, was certified organic but found the paperwork for his Red Tractor and organic inspection manageable since he did not purchase any organic inputs (which would require documentation) or rear calves (which would require compliance with calf-specific health and welfare requirements). Such farmers are not always comfortable with computers and smartphones, but had been able to fulfil their particular administrative requirements using largely paper-based methods. Some of them simply seemed less concerned than others with understanding external rules and following them to the letter.

Based on the interview discussions, another group who face much greater administrative demands but may find the workload manageable despite its recent increase are certain organic farmers or farmers with intensive, commercial businesses. They have put advanced management systems in place and are ahead of what Red Tractor in particular requires. Despite the cumulative effect of external requirements on interviewees' perceived workload and stress, it is interesting that although eco-extensive farms tend to participate in more schemes than average (2.5 versus 1.8), the eco-extensive respondents in the survey were less likely than the non-eco-extensive respondents to say that their level of paperwork was excessive (58% versus 64%). Eco-extensive farmers were also less likely than non-eco-extensive respondents to say that their paperwork had increased recently (55% versus 61%), and two eco-extensive respondents (5%) even said their paperwork had decreased. Survey respondent 129, a mixed farmer with a commercial horticulture enterprise, answered that the paperwork for their business was about the same as 2–3 years ago and was manageable. They selected farm assurance and certification as one of their top sources of paperwork, but added a note explaining: "Conformance to meet high standards of the major customers, but this is for our soft fruit. The beef [assurance] is very simple by comparison."

Table 8.4. Survey respondents' views on paperwork, by farm and enterprise type (*n*=226)
Data source: survey dataset

	Dairy	LFA	Lowland	Mixed	Small-holding	Cattle but no sheep	Cattle and sheep	Sheep but no cattle
Opinion on paperwork:								
Paperwork has increased	87%	38%	51%	62%	30%	69%	59%	44%
Paperwork is excessive	48%	37%	26%	38%	10%	37%	41%	19%
Top sources of paperwork:								
Tax and accounts	75%	85%	85%	74%	90%	79%	75%	92%
Farm assurance and certification	88%	54%	58%	81%	0%	78%	70%	47%
Livestock sales and breeding	39%	69%	71%	36%	50%	36%	58%	64%
Basic Payment Scheme	16%	41%	31%	46%	40%	27%	33%	53%
Veterinary jobs	36%	28%	17%	13%	30%	22%	25%	19%
Countryside Stewardship	7%	15%	19%	26%	0%	19%	17%	11%
Marketing and customer management	5%	5%	6%	12%	30%	9%	8%	8%
Diversification business	11%	0%	2%	12%	10%	9%	5%	8%
Land matters tenancies and planning	5%	0%	8%	3%	0%	6%	3%	3%
Buyer schemes and contracts	5%	0%	0%	3%	0%	4%	2%	0%
Livestock movements births deaths and health data	4%	3%	0%	1%	0%	3%	2%	0%
Paying bills	2%	3%	0%	0%	0%	1%	1%	0%
Staff development	2%	0%	0%	0%	0%	1%	0%	0%
Machinery maintenance	0%	0%	2%	0%	0%	1%	0%	0%
Don't know	2%	3%	0%	0%	10%	1%	1%	3%

Question 30 of the questionnaire asked respondents if there were any new requirements or legal changes that they worried would add to their workloads. Figure 8.4 shows that 28 respondents (13%) wrote answers that can be categorised as a concern with an increase in standards, bureaucracy and inspections, and 22 (10%) mentioned livestock-specific requirements.

How are external requirements affecting farm workloads?

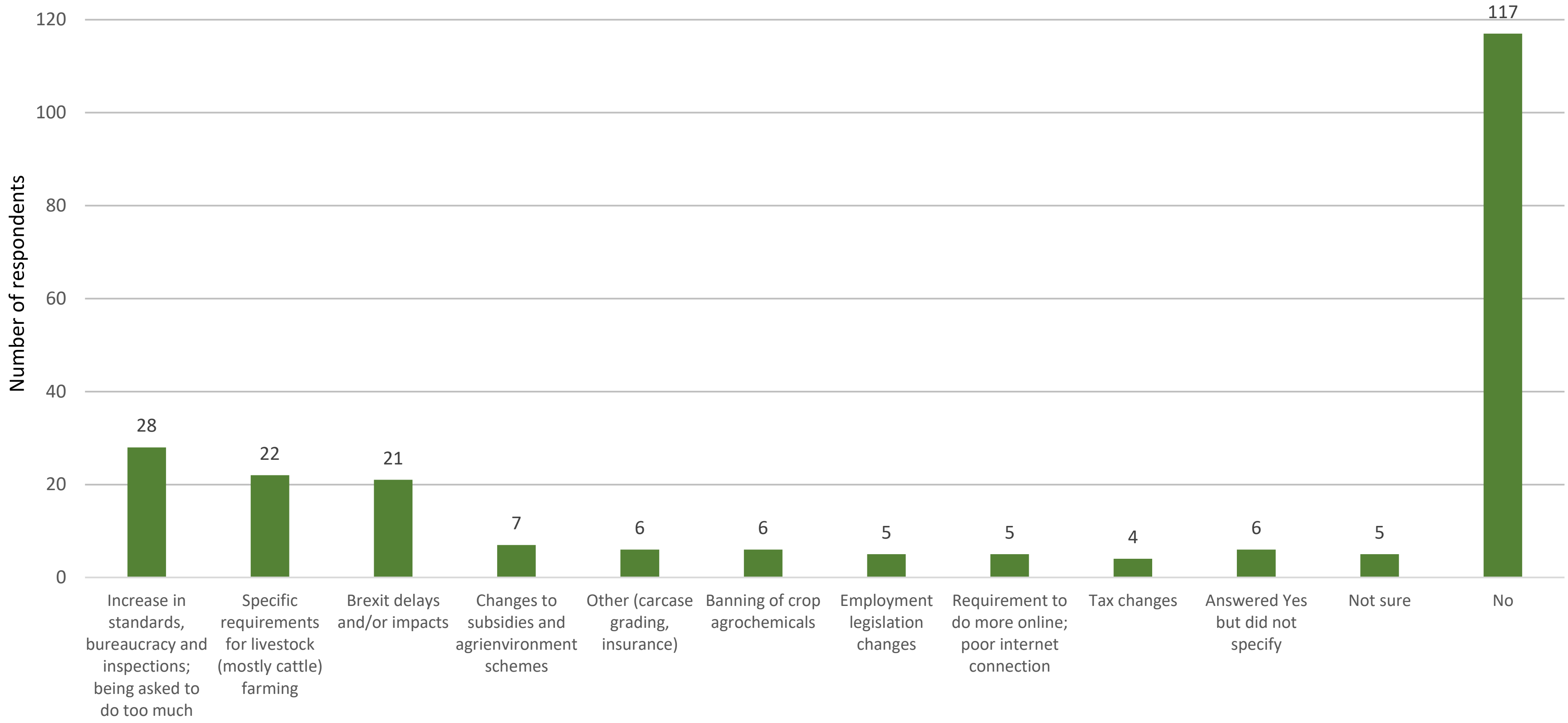


Figure 8.4. Summary of respondents' answers to question 30, 'Are there any new requirements or legal changes in the industry that you are worried about because they will increase your workload or labour costs?' (*n*=213)

Data source: survey dataset.
Answers were hand-written and have been grouped into themes; respondents could write about more than one thing.

Reflections

External requirement schemes represent a substantial source of administrative work for livestock farmers in the survey, especially Red Tractor or FAWL and the private farm assurance schemes of supermarkets and processors. In comparison with private-sector schemes, the BPS and government stewardship schemes (AES) appear to generate less paperwork. However, statutory requirements in relation to livestock sales and breeding do seem to contribute to paperwork quite significantly, while the demands of private breeding societies seem less substantial but still impactful. Diversification and direct selling appear to generate less paperwork directly than private-sector and statutory requirements, although they may add to paperwork related to tax and accounts and to marketing and customer management.

From the interviews, it is difficult to distinguish between administrative tasks that are very time-consuming, and therefore require substantial labour-input, and tasks that are very stressful. Some of the most stressful tasks highlighted by respondents, such as preparing for a TB test or Red Tractor inspection, are occasional tasks that might require less time across the whole year than a task that many respondents seem to find less stressful, such as recording animal movements, if the associated labour-input could be measured.

Aspects of the administrative tasks that many farmers seem to find least manageable, most time-consuming and/or most stressful are: peaky tasks; tasks that require the internet or a computer; tasks that involve chasing people on the phone, especially for late payments; tasks that are repetitive or involve duplication; and tasks whose purpose or value is not clear to the farmer.

A final point concerns the identity of the respondent. Based on their answers, it was possible to estimate if the survey respondent was personally involved in farm administrative work. Most respondents (n=189, 84%) did most of the administration, either alone or with a spouse, partner or employee. If the respondent was among those who did most of the admin, they were more likely than other farmers to say that paperwork was excessive (36% versus 31%), and less likely to say that paperwork was manageable (61% versus 66%). However, these differences are not statistically significant (p=0.607 and p=0.629, respectively); the role of the respondent does not seem to have strongly affected their opinion on the level of paperwork faced on their farm.

8.4.3 Managing paperwork

A common strategy for managing farm paperwork is to **do it at night**, as mentioned by nine of the interviewees. As administrative demands have grown, some farmers might have been increasing their nighttime working hours and moving (further) into a state of over-employment.

Farmers who reported doing paperwork during the day included Respondent 395, a dairy farmer of retirement age. He said that as he got older, he could not do the paperwork at night, he had to do it during the day, which led him to postpone other jobs. Respondent 524 was much younger. She had taken over the farm business paperwork from her father and found that when it was possible to do paperwork using an app on her smartphone, she could do it at any time of day, fitting it around other jobs. Respondent 52, a 61-year-old lowland farmer, also said she tried to do paperwork when she could. “No disrespect, but I’ve been doing some while we’ve been talking,” she said during the interview. Rainy days provided an alternative to the evenings for respondent 235, an LFA farmer, to catch up with paperwork. Two of the dairy farmers, Respondents 200 and 364, reported doing their paperwork during the day because they had staff to do more of the operational work on the farm.

This leads to a second way in which farmers manage administrative work, which is to **involve others**. During the interviews, it became clear that many principal farmers could only manage their paperwork by getting help from others, especially as paperwork becomes more digital and the farmers get older. This was usually a family member – a wife, son, daughter or granddaughter. One farmer, Respondent 52, got help with their Basic Payment application from their neighbour.

The questionnaire asked who handles the majority of administrative work in the farm business (Table 8.5). In most cases (78%), the bulk of administration is done by the farmer or business owner and/or a spouse or family member. When the farmer does most of the administrative work themselves, it is positively correlated with small businesses, especially smallholdings (p=0.015), lowland farms (p=0.303) and single-enterprise farms (p=0.038). Cases where the farmer did most of the administration together with a spouse are positively correlated with LFA farms (31%, p=0.030). The results suggest that on farms with a large workforce, or with multiple business elements such as contracting or diversification, it becomes less likely that the farmer or business owner will do most of the administrative work themselves, and more likely that they will do it together with a spouse or family member or that a paid staff member will do it.

Table 8.5. Who does most of the administrative work among surveyed farms, by farm type (n=227)
Data source: survey dataset

	Farmer or business owner	Spouse or family member	Farmer *and* spouse or family member	Non-family employee	External adviser
Dairy	36%	23%	20%	9%	13%
LFA	41%	13%	31%	3%	13%
Lowland	49%	14%	14%	8%	16%
Mixed	40%	21%	17%	10%	11%
Smallholding	80%	20%	/	/	/

Accountants help with book-keeping, accounts and VAT reporting. Vets also help with paperwork related to livestock health and welfare. However, farms are limited by cost in how much of their paperwork they can defer to specialists. On only 12% of farms, an external person contributes significantly to the administrative work.

The questionnaire did not capture the gender of respondents so it is not possible to identify how administrative work managed within the farm household was divided. In five interviews, it was established that the farmer's wife did most of the paperwork (including two LFA farms, one lowland, one dairy and one mixed). Sometimes administrative jobs were divided on gender lines. For example, the husband keeps the movements book and the wife keeps the medicine book; or the husband does the business accounts and the wife does the VAT. The cultural reliance on women for farm paperwork is long established (Whatmore, 1991; Gasson, 1992; Greenhalgh, 2010; Kirwan, 2010). It is evident in the case of Respondent 235, who farmed in an LFA area with her husband and two sons:

> Researcher's notes from interview: It is just her on the farm who does the paperwork… She does the paperwork in the evenings or when it's raining, like today. I asked, do you begrudge doing it? At first she thought I was asking if she is annoyed that her sons don't do it, and said that her sons refuse to take over.

Where there is an imbalance in the work done by men and women, it may be linked to the observation that it is often men in particular who cannot use computers. Whereas Respondent 235, a woman, went to computer classes to learn how to work online, the attitude among male farmers of a similar age was closer to that of Respondent 95, an LFA farmer. When asked if he had considered getting some computer training, he laughed and said no, adding: "I'm of an age where I don't know and I don't want to know." Other examples include Respondent 83, who called himself a "dinosaur" and bought data for his wife's phone but had no smartphone himself; Respondent 491, who resented the assumption that farmers needed a smartphone; or Respondent 66, who said:

> "I don't touch computers, won't even switch one on… I put myself in the vintage category. I hate technology" (Respondent 66)

Respondent 95 said that in his local farming community of upland Herefordshire, it was common among farmers aged 50 and above to not have smartphones or use computers. "It's 'the missus does it' or 'my son does it'," he said.

Whereas older respondents who were comfortable using computers had learned from working outside farming earlier in their career, lifelong farmers who resisted or were not offered training had never had the occasion to learn. In total, 11 interviewees mentioned that either they or their spouse had difficulties using computers or working online. They were almost all in their 60s or 70s and represented LFA or lowland more than dairy or mixed farming. Respondents manage this constraint by getting help from family members or an accountant who were more IT-literate; and by trying to do as much administrative work as is allowed using notebooks and paper forms. For instance, Respondent 53, a lowland farmer from Wiltshire, had got around not being computer-literate by arranging for his accountant to submit his tax returns online[15] and by applying for his Basic Payment using a paper form. “I guess I’ll have to do it [turn to computers] eventually,” he said. Sometimes when the responsibility for doing administrative work is passed from one generation to the next within the family, it marks the transition from most farm paperwork being done on paper to its being handled digitally.

For more IT-literate farmers, the very thing that creates additional time and stress for others – **working digitally** – helps them manage their paperwork more efficiently: affordable accountancy software and being able to upload documents before an inspection were both mentioned in interviews as time-savers. But paper-based systems still have a place in livestock farming. Respondent 189 is a dairy farmer with young children. He was comfortable using computers, having had an office job outside farming, but found that computers and data could overcomplicate things. For day-to-day herd management, he preferred to use a paper book for recording medications and a wall calendar called a Bray board for keeping notes on each cow (Figure 8.5).

Figure 8.5. Example of a Bray board
Source: Pappuller (2017)

[15] In 2019, it became law in England for quarterly VAT to be submitted online. Businesses with annual turnover under £85,000 were exempt.

A final strategy for managing paperwork observed during interviews is to **keep up with it throughout the year**; hence respondents updating their records every evening or doing the books every month. Some administrative tasks are more peaky than others, such as collating documents for an inspection, but where possible, farmers following this strategy would try to regularly schedule time for administration and avoid leaving paperwork to the last minute. Several interviewees used the phrase “keep on top of it”. There was a sense that if they let it slip, paperwork easily became overwhelming. Nevertheless, some farmers admitted not always being able to keep on top of their paperwork, especially at busy times, and rushing to prepare for an inspection. Allowing paperwork to lapse could be a management strategy in itself, whereby the farmer makes a strategic decision to allocate their labour-input to a more important task.

9. How livestock farmers manage workloads

One of the objectives for this study, expressed in Research Question 1b, is to understand how changes to production systems, farm businesses and routes to market are affecting the nature of work in livestock farming. The survey and interviews, as well as the literature, give some indications of this. There are observable changes that affect the amount and nature of work on individual farms. Farm labour systems must respond to these changes. At the same time, the survey and interviews show how farmers must often adjust their workloads to respond to changes in the availability of labour. This chapter documents the methods that respondents' farms were using to manage demands on their time and to respond to changes in their workloads or the availability of labour in the workforce. Its findings also help to answer Research Question 3, 'How are livestock farmers allocating time and sourcing labour to manage their workloads?'.

The methods are presented using the conceptual framework of resilience and farm system change that were outlined in Chapter 4. The chapter begins by considering the ways in which workloads and workforces may be changing, which are presented as labour pressures. It then considers how farms respond to such pressures, first through absorption and adaptation, and secondly through transformational change. These processes are depicted in Figure 9.1.

This analysis drew on qualitative information from the survey and interviews, and a small amount of statistical correlation analysis. The questionnaire and interviews revealed that respondents varied in the pressures they were facing and in how promptly they took action to relieve the pressure. The reasons for the variation appear to lie in each farm's susceptibility to labour-related pressure and its capacity to respond. Darnhofer (2021:7) refers to the latter factor as "response-ability" – an over-arching measure of a farm's resilience. The chapter addresses the research questions of whether farm labour systems have some elasticity to cope with labour pressure. It also looks at whether labour shortages were hindering farms' 'response-ability'.

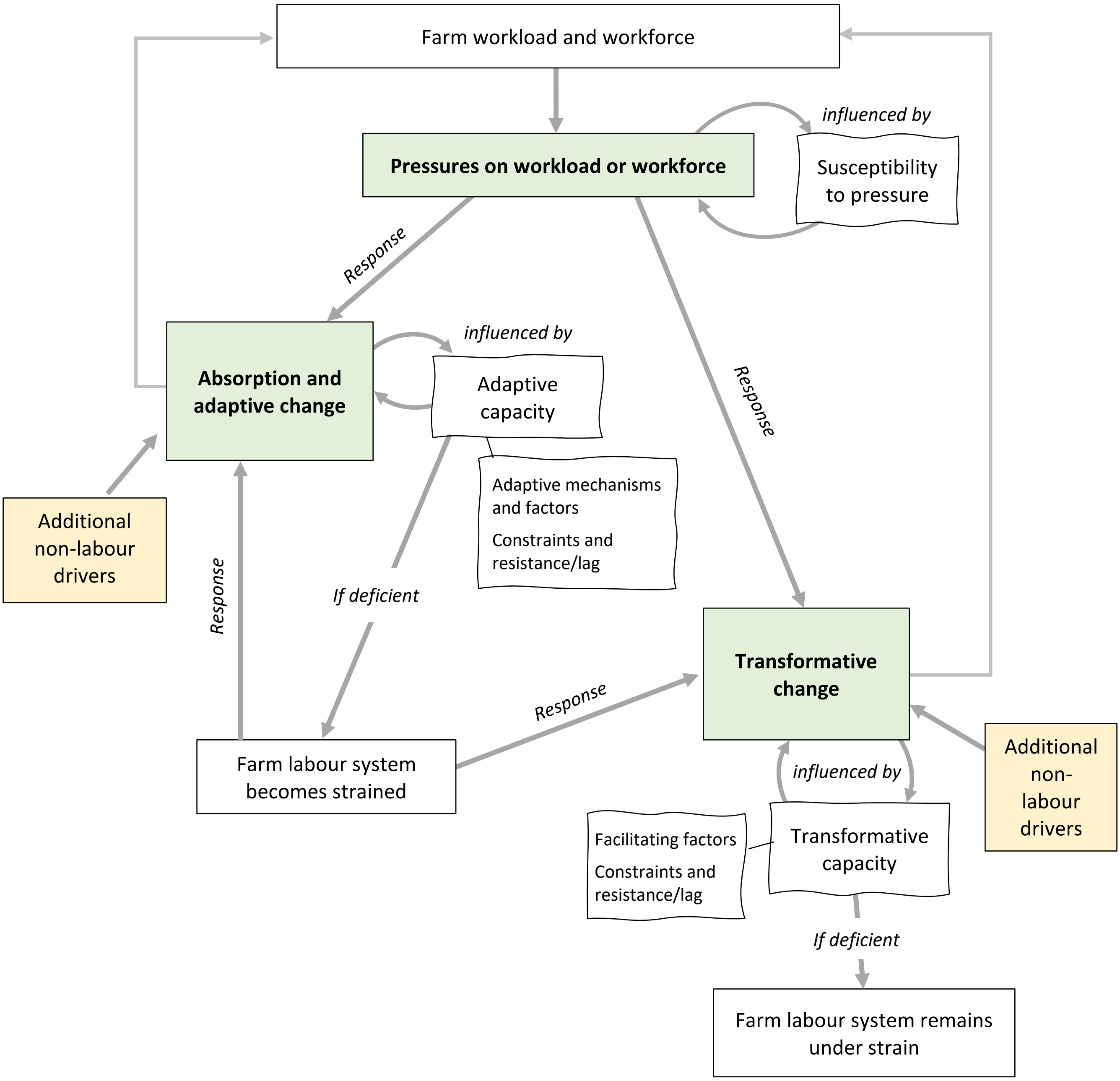


Figure 9.1. Model of how farms encounter and respond to labour pressures
Created by author

9.1 Susceptibility to workload and workforce pressures

9.2.1. Pressures on farm workloads

The first stage depicted in Figure 9.1 is a farm encountering pressure on its workload or workforce. The interviews suggest livestock farm workforces face five types of work pressure:

1. Normal routine workload;
2. Normal seasonal peaks in workload;
3. Sudden, unexpected or short-term increases in workload;
4. Gradual or long-term increases in workload;
5. Change in the nature of work.

Routine type 1 work would cover such tasks as daily milking, checking livestock, moving animals and fencing in intensive rotational grazing systems, and updating medical and movement records.

The type of work that appeared to create pressure for most interviewees' labour systems was type 2, scheduled seasonal work, especially calving and lambing. Peaky summer work such as haymaking and harvesting appeared to create pressure for fewer farmers, perhaps because contractors are typically used for those tasks. On the administrative side, paperwork that is required before livestock sales, an inspection or the annual tax reporting deadline also created pressure at certain times in the year for many respondents; scheduled livestock disease vaccinations and blood tests to a lesser degree. Sudden, unexpected increases in workload (type 3) were mentioned less often but can be significant. They included unscheduled TB tests or positive TB reactors, having to chase delayed Basic Payment or agri-environment payments, and unexpected problems caused by landlords of tenant farms.

Type 4 work pressures – gradual or longer-term increases in workload – were often a consequence of business development. These include many of the system changes that respondents reported in the questionnaire (see Chapter 7.2.3), such as adopting a labour-intensive system (e.g. cultivating fodder beet for winter mob grazing); expanding the herd or flock; acquiring more land; developing a new route to market (e.g. milk vending machine, Cost of Production contract); and launching a diversification enterprise. The most common changes can be grouped under 'farming systems and techniques' (Figure 9.2). The respondents from mixed farms and dairy farms were most likely to have made a change. Only 16% of respondents from lowland farms, 8% of the LFA respondents and one of the smallholders said in the survey that they had recently made a change which increased their workload. Machinery and infrastructure becoming outdated over time could also result in more and more work for members of the workforce. Another source of gradual or long-term increases in workload was an increase in external requirements and/or in forms of administrative work that respondents found time-consuming.

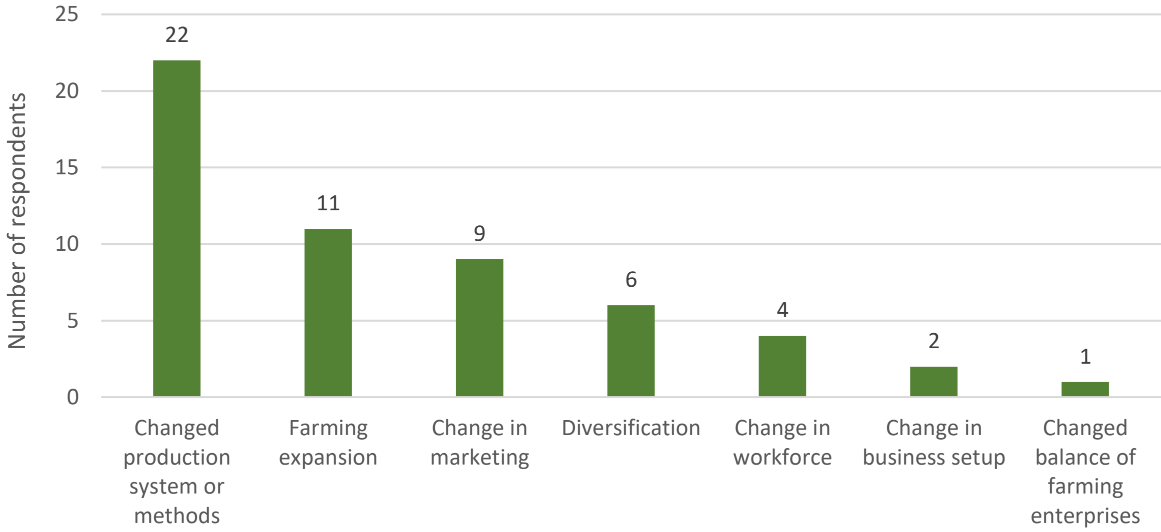


Figure 9.2. Summary of respondents' answers to the question, 'Have you made any significant changes to your farming system or marketing in the past 2–3 years which have increased your workload or your need for workers or contractors?' (*n*=48)
Data source: survey dataset

While types 1-4 affect the *amount* of work required, type 5 reflects changes in the *nature* of work. When the nature of farmwork changes, it poses challenges to the workforce members if it requires new knowledge or skills or a break with routine. Examples provided by respondents touched all aspects of a farm business, from operational work (e.g. spending less time with sheep and more with calves after an enterprise change) to paperwork (e.g. changing from paper-based to digital accounting), management (e.g. spending less time on farmwork and more time on staff management) and marketing (e.g. spending more time on direct selling).

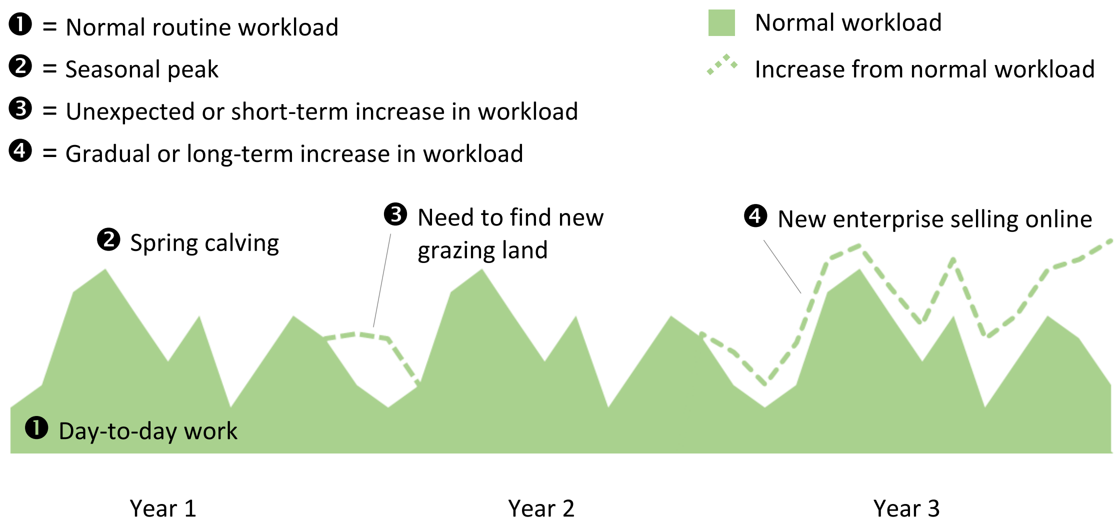


Figure 9.3. Schematic representation of a farm workload with examples of different types of pressure that cause it to fluctuate and increase over time
Created by author

9.2.2. Pressures on farm workforces

Respondents' farm workforces could change through the arrival of a new staff or family member or workforce members becoming more skilled or specialised, but the changes that create pressure on the farm labour system typically involved a reduction in the availability of labour-input (Figure 9.4), such as:

1. A sudden, short-term dip in labour-input (e.g. loss of workforce member to injury, illness or retirement; unavailability of contractors);
2. A gradual decline in labour-input (e.g. through ageing);
3. A net loss of labour-input (e.g. a workforce member spending more time in off-farm employment, a family member leaving the business).

Among the interviewed respondents, type 2 appeared to be most common, whereby older members of the workforce would reduce their labour-input over time, sometimes through a deliberate decision to semi-retire from farming and sometimes involuntarily as the person became older – and perhaps more susceptible to illness and injury – and was not able to work as long or as hard as they once did. As a dairy farmer in Shropshire wrote starkly in the questionnaire, "I'm old so [I] need another worker to do my physical work" (Respondent 226). This is part of the intergenerational succession of family farm businesses, and was often counter-balanced to some extent by a younger family member increasing their labour-input. There were also examples of type 3 when long-term workers left or retired and were not replaced, owing to the recruitment difficulties or reticence to re-hire discussed in Chapter 9.2.1.7.

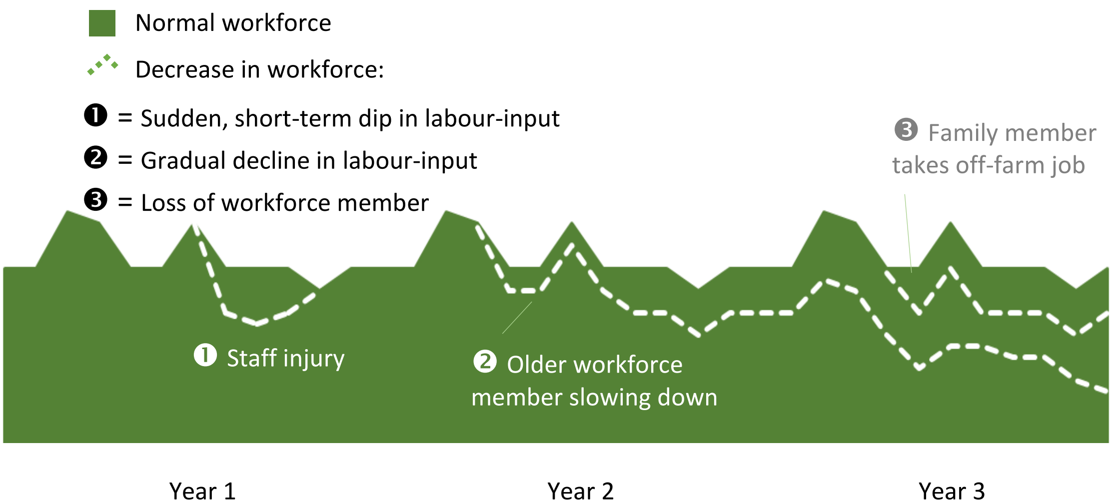


Figure 9.4. Schematic representation of a farm workforce over time, showing three ways in which the workforce experiences a decrease in available labour-input
Created by author

9.2.3. Susceptibility to labour pressures

A farm's susceptibility to labour pressure was apparently a combination of luck and skill or design. A respondent may have the misfortune to be in a high-risk TB zone or to befall an injury, but could also take measures to minimise the exposure of their business to pressures on the workload and workforce, for example by smoothing out seasonal peaks or planning for succession. Above all, farmers can design their production systems to be as labour-saving as possible and of a scale that suits the available workforce and other factors of production such as land or buildings. Arriving at such a system is a long-term process and it may take years or decades for a farm to achieve a good workload–workforce balance. Ironically, once farmers have achieved a balance they might begin to feel the pressures of ageing and must then make adjustments.

Older farmers with relatively unchanging production systems are sometimes depicted in the literature as un-dynamic and lacking a form of transformative resilience. Perhaps they should be viewed as successful farmers whose systems have undergone years of experimentation and adjustment before settling into a functional, possibly short-lived, state of balance. This sense of ebb and flow relates to the farm business development cycle described by Errington and Gasson (1994), who observed that farms were often most productive and efficient in the middle stage of a principal farmer's life.

An example from the interviews is the LFA farm run by Respondent 247 and her husband, both in their 80s. They had evolved their sheep enterprise to encompass a large flock of breeding ewes and regular acquisition of store lambs and yearlings. Sales took place at several auctions throughout the year to exploit market demand, provide regular income and smooth out labour peaks. They lambed outdoors, which left room in the sheds for winter-housing a small herd of suckler cows. With the help of hard-working contractors and flexible family members, Respondent 247 felt that her labour system was well set up and functional, although this was clearly achieved only through long working hours. However, the system was beginning to be strained by the growing need for paperwork to be done online (they had no computer) and by her husband's bad knee. They were facing a transformational moment, with her granddaughter and her husband joining the farm business and planning to not only gradually take over the paperwork but also make some changes to the production system. After a period of relative stability, the farm's workload and workforce was set to be reconfigured.

9.2 Absorbing and adjusting to labour pressures

The next stage depicted in Figure 9.1 shows the farm responding to workload and/or workforce pressure through absorption and adaptation. The resilience literature differentiates between *absorbing* a shock and *adapting* to it, whereby in the former, a system is able to buffer change and in the latter, the system makes adjustments to withstand the shock. Both are distinguished from *transformation*, a more dramatic response to shocks and pressures (Shadbolt et al., 2017; Kuhmonen, 2020; Darnhofer, 2021). The distinction between adaptation and transformation suits the difference between minor and major changes proposed by Sutherland et al in their triggering change model. In this section, some of the methods of coping on the workforce side such as stretching working hours could be interpreted as absorption, while methods on the workload side such as adjusting the labour intensity of the production system could be interpreted as adaptation.

9.2.1 Adjusting the workforce: stretch, flexibility and specialisation

The literature review and scoping interviews raised three key ways in which farmers manage their labour systems to help meet their workloads: (a) stretch or contract their working hours; (b) increase the headcount using flexible labour sources; and (c) deploy functional flexibility by reallocating labour from task to task (Figure 9.5). The questionnaire survey and respondent interviews found that all three strategies are used by livestock farmers in Herefordshire, Shropshire and Wiltshire, but that functional flexibility can clash with a further strategy of labour specialisation.

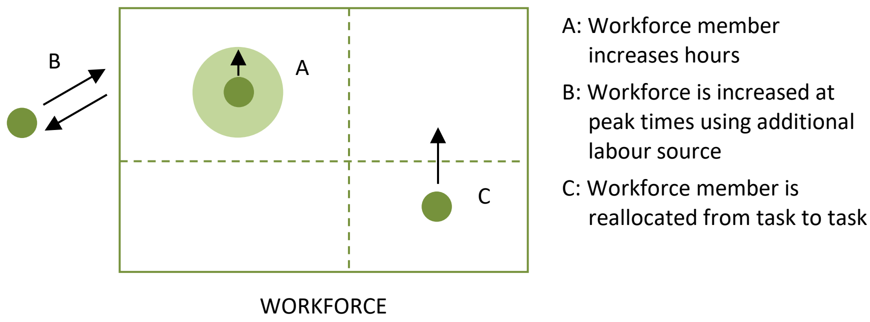


Figure 9.5. Three strategies of workforce adjustment
Created by author

9.2.1.1 Stretching working hours

The questionnaire asked respondents how they coped with shortfalls in labour. The most popular answer was "Did the work ourselves by working longer hours", being selected by 81% of respondents who answered this question (Figure 9.6).

The assessment of how interviewees manage their paperwork in section 8.4.3 has already shown that working long hours is a common coping strategy, with several farmers reporting that they did paperwork at night; while section 7.2.1 showed that farmers with peaky production systems typically work extra hours at busy times such as lambing or harvesting, as in the example of this discussion with Respondent 53 from Herefordshire:

> Researcher: "I've got the impression from talking to farmers that there is often some elasticity in the way that they work, if that is the correct word, so that they're able to just get the work done, even if it means working really long hours, and then at other times they work less hours."
>
> Respondent 53: "Yes, that is exactly right, you've got it right. Farmers just work longer hours when they need to. See, I'm doing maybe 9 hours a day at the moment [August 2020] but during lambing I'll be doing up to 21 hours a day."

For some interviewees, exceptionally busy times were balanced by quieter times, often in mid-summer or mid-winter. That is, their labour-input would stretch and contract according to demand. But other farmers reported working very long hours all year round. They had perhaps stretched their hours to cope with expanding workloads and/or shrinking workforces, and many had come to see it as normal.

Interviewees took this strategy so for granted that they were often at a loss to explain how they managed when their workloads increased. According to the survey responses, working longer hours when labour was short is especially common among dairy farmers. It was selected by 96% of the dairy respondents who answered, a significant correlation (p=0.032), followed by 86% of lowland respondents, 81% of mixed farming respondents, 81% of LFA respondents and 63% of the smallholders (n=5 of 8). Eco-extensive respondents were less likely to select this answer, but this negative correlation is not statistically significant.

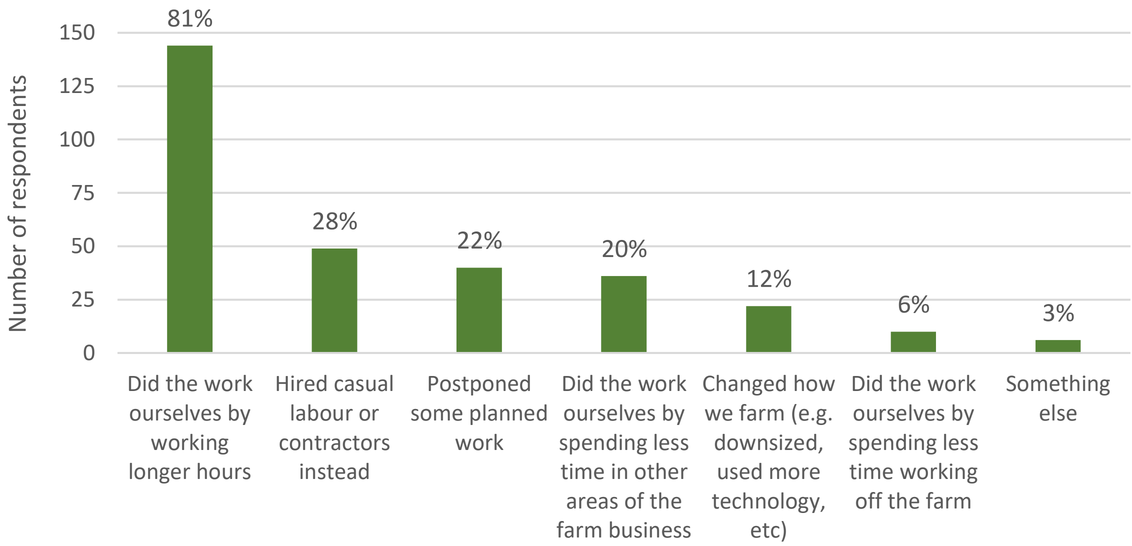


Figure 9.6. Responses to the survey question, How have you dealt with labour shortfalls? (*n*=169, excluding farmers who answered 'Not applicable')

Data source: survey dataset

Respondents could select more than one answer.

Echoing Kautsky, Gasson (1979:11) observed that family farm members are often “prepared, or obliged” to work for less than the minimum wage. In the current study, Respondent 53 said he had recently calculated with his accountant that he and his wife were earning the equivalent of £3 an hour from his small beef and sheep business, and reckoned that the exceptionally long hours he worked during lambing were a key reason for that. But it was not only family members who disclosed very long working hours. Respondent 376 is the herd manager of a predominantly beef cattle farm in Wiltshire which is staffed by non-family members. They all worked long hours – her own estimated at 9 hours a day during the week and 6 hours on Saturdays and Sundays with no holidays and longer shifts during calving. Respondent 376 complained about this, but she also said, “This is not a job, this is life.” She lived at the farm and expressed enormous emotional attachment to her cattle, which made it hard to separate home life from her job.

In 12 further interviews, respondents expressed similar thoughts. Partly, farmers worked long hours because they felt they had no choice: “If you don’t do it, no one else is going to do it” (Respondent 124). But also discernible from the interviews was a self-identification with a culture of hard work and a blurring of the personal and the professional which led respondents to accept hours that appeared in many cases to well exceed the 2,200 hours/year full-time threshold. Respondent 245, an LFA farmer in Shropshire, said he chose to work most Saturdays and Sundays after a full week: “I’d rather do that than go and sit on a beach with all the crowds in Aberystwyth or somewhere.” Dairy farmer 32 acknowledged that he and his family “are not 9–5 people” but he described how much he loved his life and his sense of good fortune in being able to farm.

By emphasising hard work, resourcefulness, self-reliance and self-denial, these farmers were expressing a kind of ethos similar to the ‘good farmer’ ethos identified by Burton (2004), where productivity, high yields and neat fields were valued while laziness was something to avoid. Some of the respondents and particularly the women, like Respondent 376, showed ambivalence about this ethos. Respondent 306, a farmer’s wife from a lowland farm in the same county, commented that “life is very hard as a farmer”. She related how rare it was for her family to have a holiday, and said that if she did take her children away when they were younger, her husband would usually stay at the farm. Respondent 247, another Shropshire LFA farmer, said that working long hours had become a habit; overhearing her on the phone, her husband called out that they had not had a holiday for 40 years.

Only a few interviewees did not employ the strategy of regularly working long days outside peak times: some, such as Respondent 389, with young children who wanted a better work–life balance; or rare cases such as Respondent 386, whose system of finishing store cattle allowed him to manage his workload relatively easily and take regular holidays. They were, perhaps, challenging the established ideal and finding ways to be 'good farmers' without excessive hours (Sutherland & Calo, 2020).

The willingness of livestock farmers to accept increased workloads by working longer hours extended to the demands of external requirement schemes. Although many respondents expressed frustration over the amount of paperwork and disease control measures they were being asked to do, they largely accepted any additional time required and neither measured that time nor explicitly refused to carry out the work – perhaps because responding to challenges by working harder is so deeply embedded in their financial coping strategies and their self-identification as (good) farmers. Robinson (2017) observed a deeply ingrained work ethic and stoicism among dairy and beef farmers in Northern Ireland. Lobley (2014) noted:

> "One of the great strengths of family businesses is the strong commitment to the business from family members. There is also a 'dark' side to this with individuals becoming so committed to and consumed by the business that their identity is wholly aligned with the business, leaving little scope for other interests" (Lobley, 2014, cited in Winter & Lobley, 2016:33]

9.2.1.2 Numerical and personal flexibility

Personal flexibility

The ability and willingness to work long hours when needed and to work at variable times, including evenings and weekends, was valued by respondents not only in themselves but also in their relatives, staff and contractors. We might think of this trait as *personal flexibility*. A definition of a workforce with a high degree of personal flexibility might be, "where workers are willing and able to work long hours when needed and where their hours of work can be easily changed".

Having members of the workforce with personal flexibility enables a farm to practise the kind of numerical flexibility where the amount of labour-input provided by individuals can be easily adjusted (see Figure 2.3 in Chapter 2). Fifteen of the interviewees gave examples of personal flexibility in other members of the workforce. This was typically when a member of the immediate or extended family – the farmer's husband or wife, the farmer's brother – either worked at weekends or evenings, on top of an off-farm job, or greatly increased their hours on the farm business at busy times such as lambing. All of those examples were from LFA or lowland farms. But five of the interviewees, all from dairy or mixed farms, referred to paid non-family workers who worked overtime when needed or who worked variable hours as a part-time, casual or self-employed worker.

Someone with personal flexibility does not necessary belong to the category of peripheral "flexible worker" as defined by Gasson and Errington (1996); that is, part-time, seasonal and casual workers, agency workers and contractors. A permanent, full-time worker has personal flexibility if they work overtime at peak times. The disadvantages of pursuing a strategy of relying on flexible workers, where the workforce contains very little permanent labour and workers constantly come and go, are that (a) it hinders stability and continuity in the workforce, and (b) accessing temporary workers, especially skilled workers, is not always easy (see section 9.2.1.7 below). It may be that a strategy of personal flexibility in a more permanent workforce is more viable for many livestock farmers, since that gives them a combination of a relatively reliable and skilled workforce with the flexibility to respond to ebbs and flows of labour demand.

Flexible worker types

This is not to say that the other kind of numerical flexibility, in the sense of increasing the headcount of the workforce, was not practised. On the contrary, the ubiquitous use of **agricultural contractors** documented in Chapter 7.3.2.4 is the very definition of temporarily adding to the workforce in accordance with specific labour needs. The interviewees explained that their main motivation for using contractors was to save on the expense of buying and maintaining machinery, but it clearly also helped them manage their workloads. Firstly, it helped farmers to keep down their fixed labour costs by outsourcing work. Secondly, farmers found that contractors can do the work more quickly than if it were done in house. Respondent 389, for example, explained that his mixed farm in Wiltshire had recently contracted out the silaging work. "What used to take us five days, takes them four hours!" he said. Thirdly, for certain tasks that require two, three or more people, such as shearing or fencing, contractors offered additional labour that small workforces might not have available. Lastly, using contractors freed farmers up to concentrate on other tasks, offering opportunities for specialisation and flexibility. Interviewees mitigated the potential loss of continuity from such a temporary labour force by forming long-lasting relationships with their contractors (Nye, 2017).

There was also widespread use of **part-time, casual and seasonal labour** among the surveyed farms. The questionnaire survey did not capture the hours worked by individual workers or how those hours fluctuated, so it is not possible to assess the degree of stretch and personal flexibility in a workforce. Nor did the survey capture the times of year or the lengths of time when temporary (casual or seasonal) workers were used. But it did capture the use of flexible workers – part-time, casual/seasonal and contractors – on each farm. To show this using the survey data, the labour provided by family and non-family workers was separated from the labour provided by the first farm holder or business owner. For example, if a respondent reported that the farm workforce comprised one full-time farm holder and one part-time family member, only the second part-time family member was counted. As Figure 9.7 shows, in addition to a principal farm business holder or owner, 59% of the surveyed farms used some part-time labour in the preceding 12 months and 31% used seasonal or casual labour. Around one in five (19%) used both. The principal owner (who would probably be described in the FBS as the *principal farmer*) is separated so that we can see how much labour they used in addition. Most farms (*n*=204) had a full-time principal owner; in 19 cases, they had no full-time holders or owners and the principal owner was only part time.

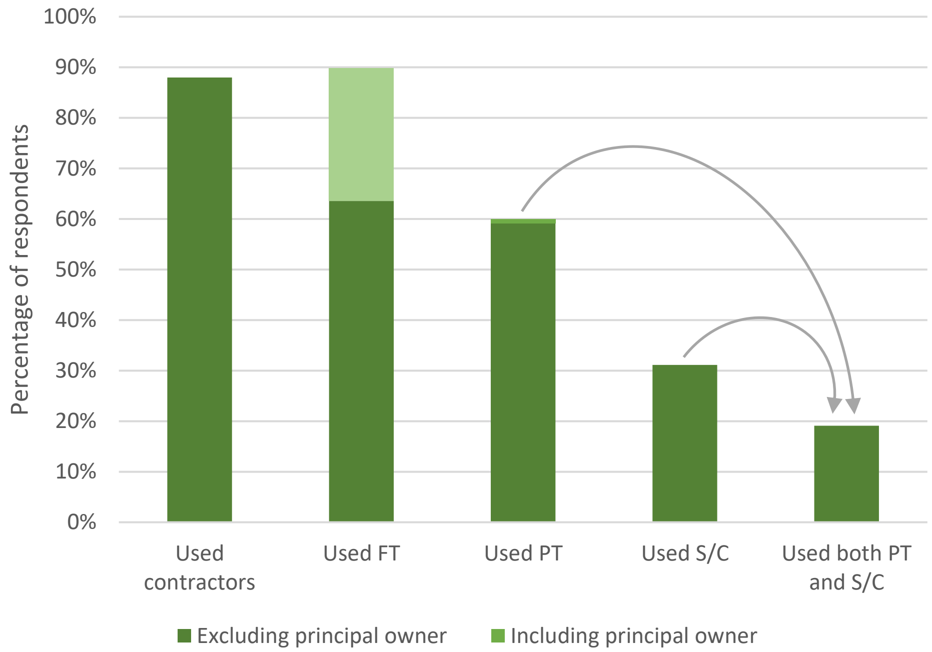


Figure 9.7. Types of labour used on surveyed farms in preceding 12 months (*n*=225)*
Data source: survey dataset
Shows percentages with and without one principal owner. **n*=224 for the contractors figure.
FT = full-time labour; PT = part-time labour; S/C = seasonal or casual labour

A breakdown by farm type and size is given in the following tables.

Table 9.1. Percentage of surveyed farms that used full-time, part-time and casual or seasonal labour in addition to principal owner in preceding 12 months, by farm type

Data source: survey dataset

		All farms	Dairy	LFA	Lowland	Mixed	Small-holding
Full time	Family members and any additional owners	52%	71%	49%	29%	59%	10%
	Non-family members	29%	61%	5%	12%	33%	0%
	From any source	**64%**	**95%**	**51%**	**35%**	**74%**	**10%**
Part time (PT)	Family members and any additional owners	46%	43%	51%	49%	45%	30%
	Non-family members	23%	36%	8%	14%	29%	20%
	From any source	**59%**	**63%**	**56%**	**63%**	**57%**	**50%**
Seasonal or casual (S/C)	Family members and any additional owners	10%	9%	8%	12%	13%	0%
	Non-family members	23%	25%	21%	16%	30%	10%
	From any source	**31%**	**30%**	**26%**	**27%**	**41%**	**10%**
Both PT and S/C	Family members and any additional owners	5%	7%	3%	4%	6%	0%
	Non-family members	5%	11%	3%	2%	4%	0%
	From any source	**19%**	**21%**	**13%**	**20%**	**23%**	**0%**
Total responses		225	56	39	51	69	10

Table 9.2. Percentage of surveyed farms that used full-time, part-time and casual or seasonal labour in addition to principal owner in preceding 12 months, by farm size (ha)

Data source: survey dataset

		<20ha	20<50ha	50<100ha	100< 200ha	≥200ha	Size unknown
Full time	Family members and any additional owners	14%	11%	48%	59%	70%	75%
	Non-family members	0%	0%	8%	36%	57%	25%
	From any source	**14%**	**11%**	**52%**	**74%**	**95%**	**75%**
Part time (PT)	Family members and any additional owners	29%	70%	42%	46%	43%	25%
	Non-family members	14%	4%	18%	25%	38%	0%
	From any source	**43%**	**74%**	**52%**	**59%**	**64%**	**25%**
Seasonal or casual (S/C)	Family members and any additional owners	0%	19%	8%	12%	10%	0%
	Non-family members	14%	0%	28%	29%	26%	0%
	From any source	**14%**	**19%**	**32%**	**38%**	**34%**	**0%**
Both PT and S/C	Family members and any additional owners	0%	7%	4%	9%	2%	0%
	Non-family members	0%	0%	4%	6%	8%	0%
	From any source	**0%**	**7%**	**18%**	**25%**	**25%**	**0%**
Total responses		14	27	50	69	61	4

The tables show that **part-time family labour** was particularly common on LFA, lowland and small farms. In the follow-up interviews, eight people – all LFA or lowland farmers – said that they got help from family members at busy times such as the few weeks of lambing: most often from the farmer's wife but sometimes others such as a son or a granddaughter. Actually, these might be considered examples of *seasonal* rather than *part-time* family labour. This would mean that these interviewees are not representative of the survey sample, since the use of additional family members on a seasonal or casual basis like this was recorded by only 8% of LFA respondents and 12% of lowland respondents in the survey. When respondents listed seasonal or casual workers in the questionnaire, they were more likely to be non-family members. This suggests that the categories of 'part time' and 'seasonal or casual' may have been blurred by respondents, which would undermine the robustness of the data categories if so. (It is sometimes difficult to distinguish between a *flexible part-time* family member and a *temporary* family member.)

As farms get larger by area, they were more likely to achieve numerical flexibility through the addition of **seasonal or casual non-family members**. Six interviewees sourced temporary help from this labour type, encompassing paid workers such as relief milkers or self-employed shepherds, and unpaid workers such as students and volunteers. In the survey, non-family sources of seasonal or casual labour were most common on mixed farms and on medium or large farms.

If we consider the numbers of flexible workers recorded on the average farm, we see again that LFA farms had the greatest reliance on part-time family workers of all farm types, averaging 0.8 people per farm, and lowland farms were similar (Figure 9.8); while part-time family members also featured strongly in the workforces of small farms (20–50ha), averaging 1.3 people per farm (Figure 9.9). The highest numbers of paid seasonal and casual workers were found on mixed and large farms.

The dairy sector has greater reliance than the others on **full-time labour**, which limits its scope for numerical flexibility but gives the potential for occasional labour surplus, as discussed below. Having a high percentage of full-time labour in the workforce, be it from owners, family members or non-family sources, is positively associated with both mixed dairy farms (p=0.025) and specialist dairy farms (p=0.044). Dairy farms also used a moderate amount of paid part-time labour, equivalent to about half a person per farm on average, and the dairy sector is where students and volunteers provided the most labour, on average.

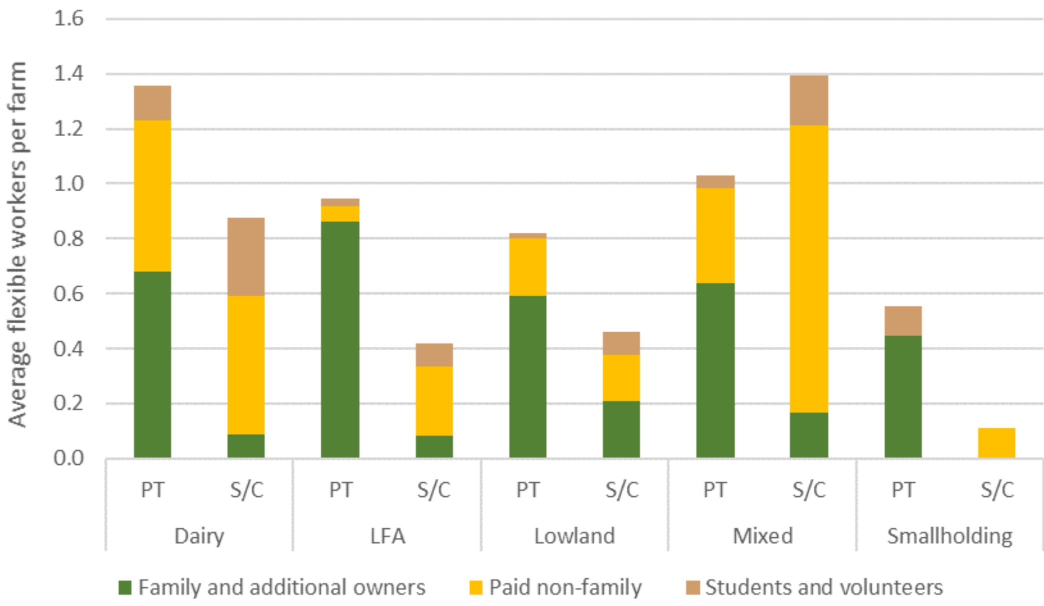


Figure 9.8. Average number of flexible workers per farm, by farm type (*n*=225)
Data source: survey dataset

Excludes two outlier mixed farms with horticulture, which had exceptionally large workforces.
Excludes principal owner if they were part time or seasonal/casual.
PT = part time, S/C = seasonal or casual

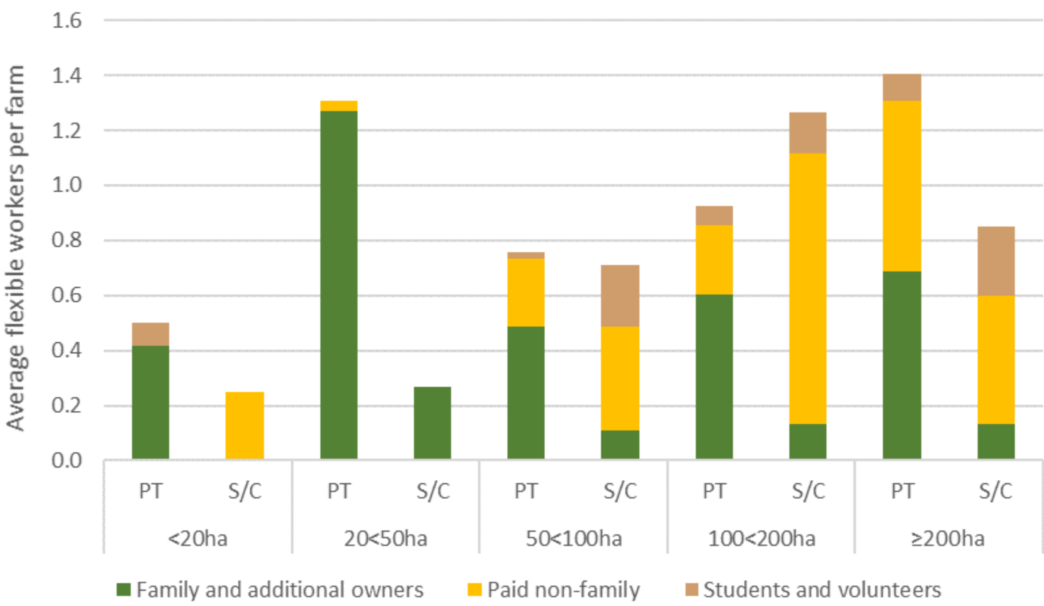


Figure 9.9. Average number of flexible workers per farm, by farm size (*n*=221)
Data source: survey dataset

Excludes four respondents whose farm size is unknown and two outlier mixed farms with horticulture, which had exceptionally large workforces.
Excludes principal owner if they were part time or seasonal/casual.
PT = part time, S/C = seasonal or casual

In Chapter 7.2, information was used from the survey and interviews to identify farming practices and enterprises that are especially peaky or whose labour demand fluctuates during the farming year. They included lambing and calving, the peak periods of arable, horticulture and poultry production, and certain types of diversification enterprise. The workforces associated with those peaky practices and enterprises were reviewed, to see if they indicate a connection with high levels of flexible labour.

The detailed findings are presented in Appendix 10, and are summarised in Table 9.3 and Figure 9.10 below. A serious limitation of this kind of exercise is that it can identify if certain peaky practices are associated with a larger presence of flexible workers in the workforce, but it cannot identify if peaky practices lead individual people to work longer hours. It also ignores many details that may affect the labour demand of particular enterprises and practices, for example, the labour demands of lambing and calving are affected by the breed (e.g. so-called 'easy-calving' breeds), the length of lambing and calving blocks, the number of animals, and so on.

Table 9.3. Percentage of surveyed farms that used full-time, part-time and casual or seasonal labour in addition to principal owner in preceding 12 months, for selected characteristics
Data source: survey dataset

		All farms in survey	Block calving once a year	Indoor lambing[a]	Horti-culture and orchards[b]	Poultry	Divers-ification	Eco-extensive
Full time	Family members and any additional owners	52%	47%	49%	63%	60%	56%	55%
	Non-family members	29%	39%	19%	50%	40%	39%	40%
	From any source	**64%**	**67%**	**57%**	**75%**	**70%**	**71%**	**69%**
Part time (PT)	Family members and any additional owners	46%	49%	48%	56%	50%	52%	50%
	Non-family members	23%	39%	19%	38%	50%	31%	38%
	From any source	**59%**	**71%**	**62%**	**75%**	**60%**	**69%**	**71%**
Seasonal or casual (S/C)	Family members and any additional owners	10%	12%	11%	19%	20%	13%	10%
	Non-family members	5%	31%	24%	31%	20%	34%	26%
	From any source	**19%**	**41%**	**32%**	**50%**	**40%**	**44%**	**33%**
Both PT and S/C	Family members and any additional owners	87%	84%	85%	75%	90%	88%	88%
	Non-family members	5%	12%	5%	13%	0%	10%	12%
	From any source	**19%**	**31%**	**21%**	**44%**	**30%**	**30%**	**31%**
Total responses		225	51	112	16	10	77	42

[a] Includes 18 farms that also did some outdoor lambing, in combination with indoor lambing.
[b] Excludes field-scale vegetables. Includes two outlier farms with horticulture with exceptionally large workforces.

With those limitations in mind, we note that all of the characteristics that were reviewed, except arable farming, were found to be associated with a higher than average likelihood of a farm using flexible labour, and a larger presence of flexible labour in the average farm workforce, either quantitatively or in proportion to full-time labour.

The characteristics where the greatest proportions of flexible labour in their additional workforces (i.e. additional to the principal owner) were observed are poultry, horticulture or orchards, and indoor lambing. Most of the farms that did indoor lambing also reported greater use of flexible labour than others. The farms with horticulture had the highest average percentage of seasonal or casual workers in their workforces (45%), and the farms that did indoor lambing and had a poultry enterprise had the highest percentage of part-time workers (34% and 32%, respectively). When indoor lambing was practised in combination with block calving once a year, it is associated with particularly high percentages of farms using part-time (71%) and seasonal or casual workers (46%). Flexible labour could come from family or non-family sources: indoor lambing is associated with a high contribution of flexible family labour (27% of total additional workforce), whereas horticulture (49%) and poultry (51%) are associated with the highest proportions of non-family sources of flexible labour. Figure 9.10 illustrates how part-time workers tend to be family members, while seasonal and casual workers are predominantly paid non-family members.

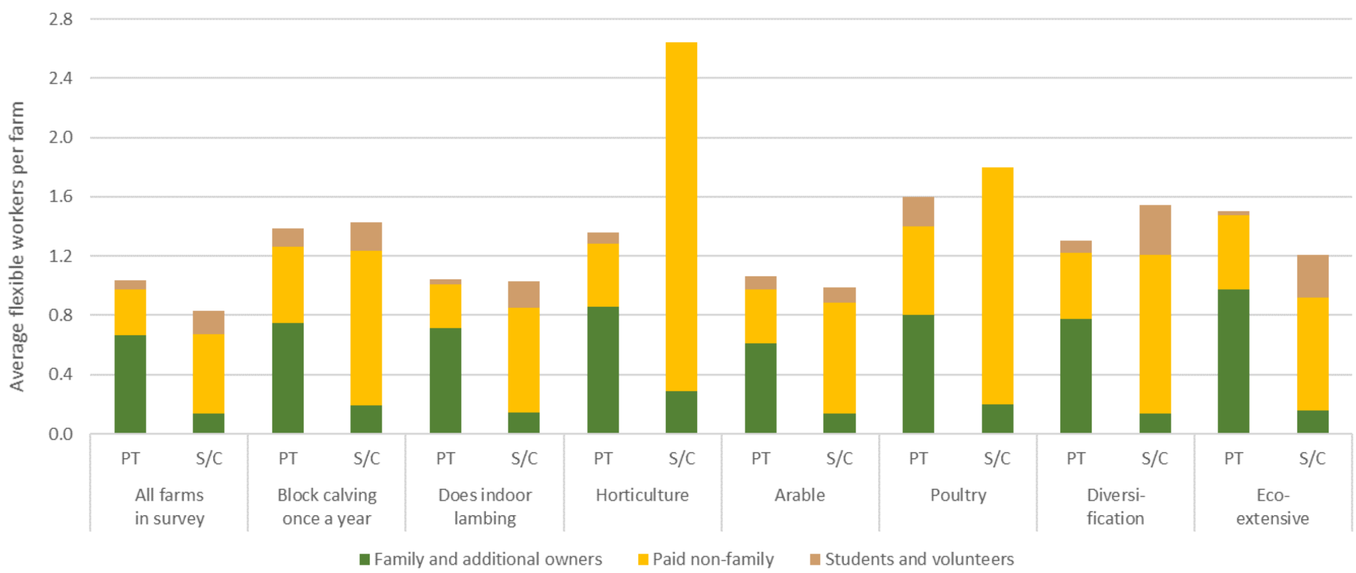


Figure 9.10. Average number of flexible workers per farm, by selected farm characteristic (*n*=225)
Data source: survey dataset

Excludes two outlier mixed farms with horticulture, which had exceptionally large workforces.
Excludes principal owner if they were part time or seasonal/casual.
PT = part time, S/C = seasonal or casual

This exercise did not use any statistical techniques to control for confounding variables or to test the strength of the observed correlations. Even if certain peaky practices are associated with a larger presence of flexible workers in the workforce to a statistically significant level, this exercise alone cannot identify if peaky practices lead individual people to work longer hours. Therefore we cannot say with confidence that any one aspect of a farming business is the sole reason why flexible labour is used. That said, it does seem likely that the reason why the mixed farms in the sample tended to use more seasonal or casual labour than others is that many of them had enterprises or followed farming practices that have peaky labour requirements – block calving, horticulture, poultry and diversification.

Where mixed farms tended to use paid seasonal or casual labour, LFA and lowland farms tended to use part-time family labour. It is not clear why the LFA and lowland farms did not use more temporary, seasonal workers when so many of them practised seasonal tasks such as lambing and calving. Indeed, only 26% of all LFA farms in the survey used seasonal or casual labour: the lowest percentage of all farm types in the survey except smallholdings.

One theory proposed in Appendix 10 is that **standalone, high-value enterprises** common on mixed farms such as horticulture or poultry create more demand for flexible non-family labour, or at least use more flexible non-family labour, than aspects of core field and livestock operations such as lambing. That is, perhaps high-value, standalone enterprises rely more on non-family labour and numerical flexibility, and core arable and livestock production systems rely more on family labour and personal flexibility.

Another theory is that the part-time labour that we observe on LFA and lowland farms is not associated with any particular peaky enterprise or farming practice – rather, perhaps the part-time workers on these farms are used to handle the **everyday farming work**, and those workers are part-time rather than full-time because they combine the farming work with off-farm employment, because they are semi-retired or simply because the average LFA or lowland farm cannot afford to hire a full-time worker.

The workforce data associated with indoor and outdoor lambing were confusing and did not offer a clear picture, but a tentative interpretation is that the LFA farms did not respond to the peaky labour demands of lambing by recruiting flexible labour to the same extent as other farms did. This may be because there is **under-employment or surplus labour** in the average LFA farm workforce, so they did not need so much additional help; or because LFA farms had less access to, or ability to pay for, additional family and non-family labour than other farms, and so at peak lambing times the LFA farmers must meet much of the additional labour demand by working longer hours themselves, entering into over-employment at those peak times.

More data would be needed to know what was going on. Certainly, the survey and interviews revealed some obstacles which prevented some LFA farmers and others from being able to access additional help (see section 9.2.1.7 below). Despite the widespread use of flexible labour, it is not clear from the interviews that the farmers could always add to their workforces quickly, which was part of Atkinson's (1984) definition of numerical flexibility. The respondents who used flexible workers were often *anticipating* increased labour demand rather than *responding* to it, since some temporary labour sources needed to be arranged well in advance. As we will see later in this chapter, there are affordability and availability issues that hinder farms from sourcing temporary paid labour in response to increased labour demand. When answering the survey question on labour shortfalls, only 28% of the respondents said they coped by hiring casual labour or contractors. They included 40% of the dairy respondents, 31% of the lowland respondents, 25% of the mixed respondents, 19% of the LFA respondents and one of the smallholders. A further three respondents (two mixed and one dairy) added that they hired emergency labour from an agency.

Using informal help from other farmers in emergencies would be an example of rapid numerical flexibility. This method of managing workload pressures is what we turn to next.

9.2.1.3 Informal help from other farmers

One third of survey respondents (*n*=73) had received informal assistance from other farmers in the preceding 12 months, representing an additional source of labour for livestock farms. The most common forms of help were: informal advice or participating in more formal discussion groups on topics such as grazing, breeding, lame animals or pest control, categorised here as 'knowledge exchange'; help with animals, such as helping with a TB test or moving sheep; and tasks related to infrastructure and machinery, such as carting straw or repairing tractors (Figure 9.11). Most farms (82%) used informal help in just one of these areas. Informal help is likely unpaid, contrasting with paid contracted work that might be sourced.

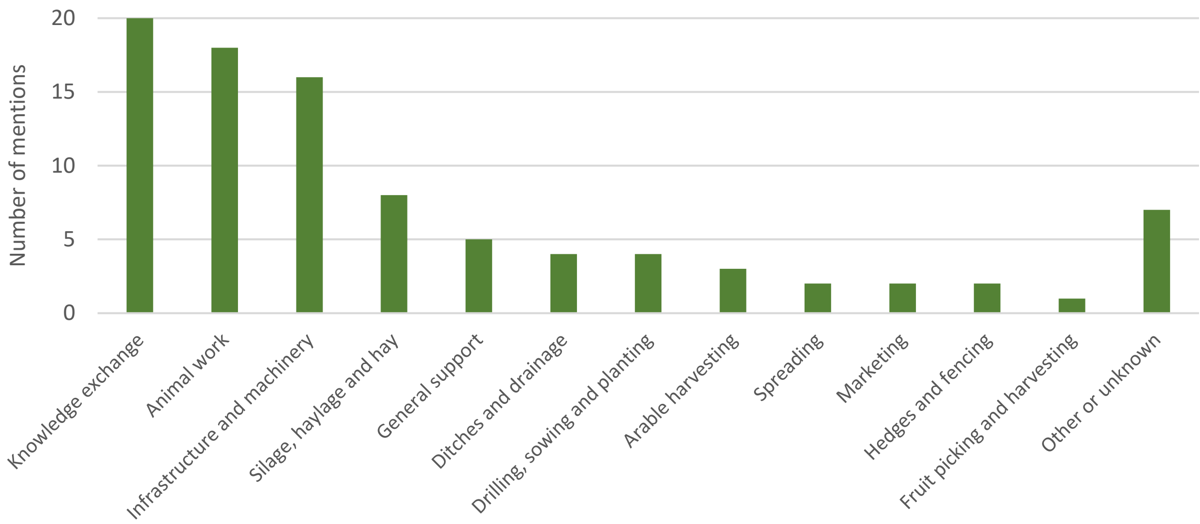


Figure 9.11. Types of help provided to surveyed farms by other farmers (*n* =73, respondents could mention more than one thing)
Data source: survey dataset

Knowledge exchange: includes informal advice as well as more formal discussion groups and a grassland survey.
Animal work: especially help with TB tests and general moving and handling of livestock.
Infrastructure and machinery: help with carting and hauling; also repairing, borrowing or making use of machinery and mucking out.

The dairy farmers in the survey used informal help the most (37%), followed by 34% of mixed farming respondents, 33% of lowland respondents, 29% of LFA respondents and 18% of smallholders. On dairy and mixed farms, it was more common for the farms with non-family staff to have used informal help (37% and 42%, respectively) than the farms that just had family members (26% and 10%, respectively). Furthermore, the dairy farms that used informal help had a larger average workforce than those that did not (average FTE per farm was 7.1 with informal help and 5.2 without; and the average number of people was 8.5 with informal help and 4.3 without). Similarly, for mixed farms the average number of people was higher for those which used informal help (5.4 people) than for those which did not (4.5 people).

Multi-faceted farms, in the sense of having several enterprises or elements to the business, were more likely to have used informal help than simpler farm businesses. There is a significant positive association between using informal help and the number of farm business elements (p=0.031), and there are positive associations tending to significance with having a contracting business (p=0.081) and a diversification business (p=0.088).

Thus, it appears that informal help was used most by farms that had diverse farm businesses and were already well endowed with human capital.

Among LFA farms, lowland farms and smallholdings, although their use of informal help was lower overall, those farms that did use informal help were more likely to be sole operations (33%) or just have family members (32%) than to have non-family labour (18%).

One interpretation of these results is that some farms with paid workers, especially dairy and mixed farms, rely more on informal help because they cannot call on as much family labour for occasional help or emergencies. An alternative interpretation is that they used informal help to complement the existing workforce rather than as a substitute for labour. Whereas other farms, particularly LFA farms, used informal labour in the absence of, and perhaps in the place of, existing family labour, paid labour or contractors.

Box 3. The most common types of informal help that respondents got from other farmers

Dairy farms:

- Knowledge and advice (e.g. grazing discussion, business advice, benchmarking)
- Silage-making
- Help with livestock (e.g. TB tests, herd health and breeding)

Mixed farms:

- Knowledge and advice (e.g. on tillage, lameness)
- Help with livestock (e.g. TB tests, sheep work)
- Machinery work (e.g. hauling, carting, drilling)

LFA grazing livestock farms:

- Help with livestock(e.g. sheep shearing, TB testing, livestock health)
- Machinery work (e.g. lending a tractor and trailer, hauling, muck spreading)
- Knowledge and advice (e.g. about marketing)

Lowland grazing livestock farms:

- Knowledge and advice (e.g. about loans, lambing, fodder beet)
- Help with livestock (e.g. TB tests, checking stock)
- Machinery and building work (e.g. muck spreading, cleaning out sheds, tractor repair)

Considering the tasks that other farmers helped with (Box 3), it makes sense that informal help complements rather than substitutes for family or non-family labour. There was some evidence for cooperative work – sharing machinery, for example, or working on common fence and ditch boundaries – but this was rare. Informal help was less about cooperation and more about problem-solving. This included help in emergencies, as these questionnaire comments illustrate:

> "Feeding silage when own equipment was broke."
>
> "Holiday cover, tricky calvings."
>
> "Routine sheep work when I was ill."
>
> "Unexpected problems e.g. fallen tree across lane, yard flooded, cow stuck in drainage pipes."

Survey respondents in villages were more likely to have used informal help than respondents in sparse hamlets or isolated dwellings or urban fringes. The interviews illuminated how geographical remoteness discouraged some upland farmers from collaborating. Asked why she did not use any informal help, Shropshire LFA farmer 247 replied, "Well, we don't live right next to anyone. The nearest farmer is a couple of miles away, and he thinks he knows everything." Respondent 245 is a pedigree sheep farmer in Shropshire. He had neighbours nearby but increasing specialisation led their farms to diverge, so they had less to offer each other in machinery, skills or advice. Respondent 243, another LFA farmer in Shropshire, observed that dairy farmers had become accustomed to sharing ideas and advice, whereas beef and sheep farmers were still quite private:

> "People say that British farmers won't work together, but I think that's an exaggeration. Around here we try to help each other as much as we can. It's more that farmers like to keep their businesses apart."

In upland Herefordshire, Respondent 124 agreed that farmers liked to keep things close to their chest, although he thought farmers were becoming more open with each other. Other researchers have observed a hesitancy among upland farmers to work cooperatively (Mansfield & Peck, 2013; Elster Jones, 2015).

Some older interviewees described traditions of mutual practical help that were displaced by the rise of contracting, such as farmers with special kit doing work on each others' farms or farmers sharing machinery ownership. Veterinary advances have also made some tasks less burdensome and therefore reduced the need to draft in assistance. An example is the development of sprays for blowfly strike, which have replaced the more laborious task of sheep dipping that respondent 124 described.

Similar dynamics were described by Gasson in 1979, and again with her co-author Errington in the 1990s, when they noted that new ways of accessing labour were making farmers' personal networks less important and that as farms became larger and workforces became smaller, there were "fewer people in a given locality to help a neighbour in an emergency" (1996:30). Some researchers documented an increase in cooperative work in New Zealand after the removal of farm subsidies (Wallace, 2014; see Appendix 6). So far, it does not seem that mutual help is being widely used by livestock farmers in the study regions as a cost-cutting way to manage their workloads, although it remains to be seen if that changes after the BPS is removed.

To see if farmers were tapping into other knowledge-exchange networks, the questionnaire asked respondents if they found certain routes to market useful for accessing knowledge, advice or training. According to the responses, livestock markets and auctions are felt by farmers to be the most beneficial channel, mainly as a way to share knowledge (stated by 49% of respondents). As we saw, not many farmers were selling to a supermarket as part of a producer group, but most who did said it also offers a way for them to share knowledge. Some farmers found certification schemes useful as a means of getting advice. However, 60% of respondents said that they did not perceive any such benefits from certification, and many did not find the other channels useful either. One dairy farmer said the supermarket they sold to “isn't helpful” and that being part of a certification scheme “teaches us nothing”. Alternative sources of information and advice were mentioned by some respondents instead, such as their vet, a buyers’ group, the AHDB and Farming Connect (a farming support programme funded by the Welsh government and the EU).

9.2.1.4 Surplus labour

The impression given by many interviewees is that in order to meet their workloads while controlling labour costs, they tried to mould their workforces to the peaks and troughs in labour demand over the farming year . Where respondents could not manage the fluctuating demand by stretching and contracting their own working hours alone, they used additional sources of labour that could provide similar flexibility (Figure 9.12). In the words of Respondent 389, “We’re trying to only employ labour when we need it.” Respondent 83 also followed this strategy, and said he sometimes felt guilty for only using young self-employed contractors at peak season:

> “It feels like a cheek to ask them to work four weeks for you during harvest, and then autumn comes and you’ve got no work for them… In the past, those young men would have worked for a single farm as a permanent General Farmworker. But then you’d have the problem of needing to find them work over the winter while still paying them a salary.”

Farms that do not use so much flexible labour may have more slack or surplus in the labour system. Dairy farmer 181, for example, employed three full-time staff including a herd manager, which enabled him to ‘only’ work 60 hours a week and take holidays.

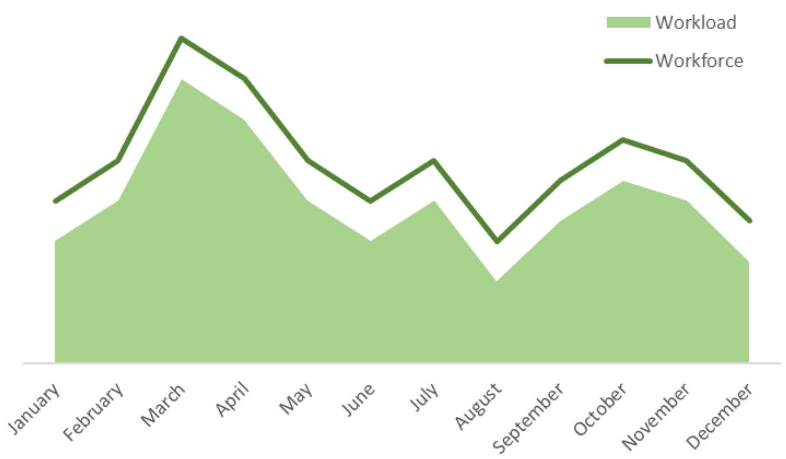


Figure 9.12. Schematic representation of moulding the workforce to the workload over the year
Created by author

Interview respondent 432 sold lambs to a supermarket under a Cost of Production contract, and the guaranteed income allowed him to muster a relatively large workforce that was deliberately designed with some slack. He explained: “We like to have a spare person in the yard during lambing [three times a year]. The work is so time-critical that if someone gets ill, I can’t afford to train someone else up.” He achieved this labour surplus not through employing permanent staff, however, but through heavy use of self-employed shepherds. He was therefore achieving surplus labour while maintaining a strategy of flexible labour sourcing, simply by hiring more people than the minimum required. It is worth repeating that he was in the position to do so thanks to a contract that was both lucrative and stable; an unusual situation for livestock producers. Ball (1987) identified two kinds of intermittent farm labour: the well-established use of seasonal workers at peak times, and a newer form of casualisation, where permanent workers are replaced by casual or occasional workers. The case of Respondent 432 is an amalgam of both. He hired self-employed people not only to cope with the peakiness of lambing more than once a year, but also to keep fixed costs low and thus casualise the workforce.

Pockets of available labour might also occur throughout the year if farms have diverse enterprises. An example of this was given by Respondent 210, the dairy manager on a mixed estate. He explained that at lambing time, he and his dairy staff would help to gather and turn out sheep on the estate. Later in the year, he would collect straw from the arable enterprise for bedding cattle, but if harvest came early and coincided with calving, then the estate’s shepherd would collect the straw instead.

Further evidence for a labour surplus comes from the experiences of mixed farms that had ceased dairying. In the questionnaire, a respondent from a mixed farm in Wiltshire wrote that quitting dairy had indirectly led to an increase in his workload. In his words:

> “Sold dairy herd 2 years ago, so I can no longer afford to pay 2 employees. I do most of the work myself with a bit of part-time help” (Respondent 351)

During the interviews, another farmer who had left dairying and stopped employing dairy workers, Respondent 20, described how even without the workload of daily milking, she and her husband had noticed they had less labour available on the farm. Their dairy workers used to help out in the non-dairy parts of the business, such as calf rearing, cleaning machinery and yards, or fencing.

Thus some farms with multiple enterprises, especially if that includes a dairy enterprise, may have surplus labour available. This could be because dairy enterprises subsidise the wages of non-dairy staff, who then become unaffordable if the farm leaves dairying. Alternatively, full-time workers employed by the dairy enterprise may find time to work on non-dairy aspects of the farm business. Leaving dairying can reduce the farm workload in many ways – no more daily milkings, perhaps less paperwork for farm assurance – but it can also cause a net increase in workload for the remaining workers.

This leads to a consideration of functional flexibility, or the capacity of a farm labour system to reallocate labour from one task to another.

9.2.1.5 Functional flexibility and specialisation

The theory holds that functional flexibility helps businesses to meet their workloads efficiently, because they can respond to emerging needs quickly using labour that is already present in the workforce (Atkinson, 1984). According to interviewees, having members of the workforce who can turn their hand to a range of tasks is an important part of workload management. But individuals will often choose, or be allocated, to focus on a certain area. If anything, the interviews highlighted how common divisions of labour are within livestock farming workforces, even without considering the outsourcing of highly specialist tasks to contractors.

It was noted above how administrative duties are often apportioned so that, for example, the farmer's wife keeps the farm accounts and her husband keeps the medicine book. Respondents described how operational work, too, was sometimes divided up. In some cases this had been a strategic business decision. Respondent 389 explained that the efficiency of his Wiltshire farm business had been improved since he and his brother had each decided to specialise in a different part of their cattle enterprise. In other cases, the division of labour happened more naturally, based on the aptitude or skill of the individuals concerned (or perhaps gendered assumptions of the kind of work that men and women should do). LFA farmer 235, who worked with her husband and two sons, said "we all pitch in", but observed that one of her sons favoured working with machinery, and the other with livestock. She, it may be recalled, had been burdened with most of the paperwork.

Farms with larger workforces can afford to develop more specialist roles than the self-sufficient farms with small workforces (Harrison & Getz, 2015). This applies to mixed farms in the sample, but even some specialist, single-enterprise farms might have workers who focused on one area: pasteurising, say, or calf-rearing, or tractor-driving, or breeding. Shropshire dairy farmer 210 explained his rationale for contracting out all of his field operations:

> "If I'm sitting on a tractor, it means I have less time to look at livestock. There is always an animal that needs looking at. If you work for me, you have to be a livestock specialist."

The need for successful livestock production systems to develop specialist skills makes it difficult to also follow a strategy of functional flexibility. Sometimes, re-allocating labour could even be a liability:

> Respondent 404: "Trying to find multi-talented people who had skills, or actually a passion, for both machinery and stock was very difficult… You tend to find that people like one or the other. Historically on the farm, say 20 years ago, the level of stockmanship required was much less intense than it is today. Now, what with antibiotics withdrawal and having such a detailed system, things have changed and you need to handle more of it yourself without going to the vet… Also, there just isn't the money to allow staff to go off for [training], or the time, when you're an all-year-round calving and arable operation."
>
> Researcher: "Did your staff used to help out across the arable and dairy enterprises?"
>
> Respondent 404: "Yes, sometimes, but the arable staff would want to do everything in a hurry, and would stress the cows. They are very different skill sets."

The major exception to this pattern, hinted at above with the dairy examples, is the importance of having people available to help out on tasks that are not particularly specialised but require more than one person, such as re-hanging a farm gate or gathering cattle for TB testing. When workforces become too lean, such tasks become very time-consuming. A common feature, mentioned both by respondents who felt under-manned and by respondents who were glad to have the available labour, was the value in having "a third pair of hands". It may be that a characteristic of 'stretched' farms are those that do not have a regular presence of at least three people in the workforce and have not adjusted their workloads accordingly.

9.2.1.6 Permanently increasing the size of the workforce

Some respondents discussed going beyond a strategy of stretching or temporarily adding to their workforces, and resolving their workforce–workload imbalance by permanently increasing the size of the workforce.

One way to do this was for a family member to spend more time on the farm, and less time in off-farm employment. The wife of respondent 395 had given up her job to work on the farm after his father died, while the wife of interviewee 245 was considering going part time in her job to help out more. In the questionnaire, 10 respondents selected "Did the work ourselves by spending less time working off the farm" as a strategy for dealing with a labour shortfall. The respondents represented three mixed, three lowland, two LFA and one dairy farm, and one smallholding. This response is positively associated with large farms by farmed area (p=0.031), but negatively associated with large FTE and large number of people who work on the farm. With only 10 respondents, the statistical findings are limited.

Other interviewees were considering recruiting additional paid staff. Respondent 243 explained during an interview her plans to find a share farmer to join the business and take over some of the work. This might be considered more of a major change than a minor adjustment – see section 9.3 for more discussion.

Accessing non-family labour, whether temporary or permanent, was often constrained by cost pressures and by recruitment difficulties, as we discuss next.

9.2.1.7 Challenges accessing non-family labour

Recruitment difficulties

Just under one-quarter of respondents (*n*=53, 24%) said they had had difficulties recruiting workers or contractors in the past 2–3 years. Of the 168 who said no, some experienced no difficulties and others found the question not applicable as they had not attempted to hire people.

By farm type, recruitment difficulties were most common among dairy farmers (40%, p=0.001), who mostly struggled to hire milking and dairy staff. Then 27% of the respondents from mixed farms also answered yes to this question (this is not statistically significant); their difficulties mostly lay in finding seasonal workers such as fruit pickers, general farmworkers or staff to work with poultry. In contrast, LFA farms are negatively correlated with recruitment difficulties (11%, p=0.033), and lowland farms to a lesser extent. This pattern is aligned with the use of non-family labour by the four types: the more a farm uses non-family labour, the more likely it is to have experienced recruitment difficulties. The four LFA respondents who answered yes to this question mentioned difficulties finding help at lambing time, sheep shearers, contractors for spraying and infrastructure jobs, and a share farmer (Respondent 245). Among lowland farmers there was no clear area of recruitment difficulty but respondents listed difficulties finding cattle stockmen, help with lambing and contractors for such as livestock transport or farm building repairs (Table 9.4).

The eco-extensive farms were positively correlated with recruitment difficulties. Like dairy farms, they also reported high levels of paid labour. However, having a diversification enterprise or contracting business, or doing direct sales, does not make a farm particularly likely to have experienced recruitment difficulties.

Table 9.4. Types of workers and contractors that were difficult for survey respondents to find
Data source: survey dataset

Workers or contractors	Total mentions
Fruit pickers, poultry workers, manual workers, general farmworkers, seasonal workers or students	17
Dairy workers	15
Cattle workers	11
Sheep workers and contractors (e.g. lambing, shearing)	7
Contractors for field operations, builders or hauliers	7
General skilled or trained staff, or share farmers	4
Staff for a diversification business	2

Excluding smallholdings, 18 farms in the survey had field-scale vegetables, soft fruit or orchards, 15 of them in Herefordshire. Herefordshire is a historical orchard-growing area, producing eating and cider apples (Rimmington, 2012). Seven of those 18 respondents had recruitment difficulties. However, only three of these cases related to hiring seasonal apple pickers and one for potato graders; the others referred to labour for other parts of the farm business. Thus four of the 18 (22%) experienced horticultural labour issues. They may not be representative of the more specialist UK horticultural businesses that have reported serious labour shortages (Migration Advisory Committee, 2018; Capper, 2019).

Recruitment difficulties were reported most often by respondents in Wiltshire (42% of all respondents in that county), followed by 23% of respondents in Shropshire, 20% in Herefordshire and 6% in Powys. To some extent this reflects the distribution of eco-extensive farms in Wiltshire and dairy farms in Wiltshire and Shropshire, but there are other factors at play. Not only did 50% of the Wiltshire dairy respondents report recruitment challenges, so too did 56% of the Wiltshire lowland farmers and 27% of the Wiltshire mixed farmers also.

Compared with Herefordshire and Shropshire, Wiltshire has a higher population density and fewer remote rural farming communities. Its population density in 2018 was 153 people/km^2, compared with 100 people/km^2 in Shropshire, 88 people/km^2 in Herefordshire and 26 people/km^2 in Powys (Office For National Statistics, 2019a). Wiltshire has no rural settlements defined as "sparse", unlike the other three counties (Defra, 2011a,b).

Respondents whose farms are located in a "non-sparse" village or hamlet – that is, not in a sparsely populated or remote setting – were much more likely to report recruitment difficulties (29-30%) than either farmers in more remote areas (0-15%) or closer to an urban centre (11%). Those non-remote rural settings accounted for almost all of the Wiltshire farms (n=43, 93%), whereas many more of the respondents in the other counties lived in sparse rural settings.

The drivers of recruitment difficulties in Wiltshire could be disappearance of some farms, enlargement of others and a concurrent increase in the cost of rural accommodation, leading to fewer skilled workers being locally available. One of the interviewees from Wiltshire, Respondent 404, discussed the topic at length. She had found it more and more difficult to find staff for her dairy enterprise, which she attributed to the high cost of accommodation in rural Wiltshire and the tradition of allowing retired farmworkers to remain in tied farm cottages. She had turned to a relief agency but even then had problems, finding that the high demand for labour meant that agency workers would readily move to a different job. Another Wiltshire dairy farmer, Respondent 364, was able to offer a house on the farm to one of his workers, which had helped to stabilise the workforce after several foreign staff came and went in quick succession.

> Researcher: “Is it important to offer accommodation?”
>
> Respondent 364: “Oh, you have to. But it’s a double-edged sword, because if you get [hire] the wrong person, it’s difficult to get them out.”

Fellow dairy farmer 210 believes that many of the recruitment difficulties in the dairy sector stem from a failure to provide good working conditions:

> “Farmers are struggling to hire people because they assume workers will work 70 or 80 hours a week and live in a static caravan next to the calves.”

Only six survey respondents reported difficulties finding agricultural contractors. Interviewees explained that contractors in their local area were plentiful, and they often had a regular contractor who had been with them for years if not decades. An LFA farmer in Shropshire said that in her area, young people from farming families had set themselves up as contractors since the family farm could not sustain them and opportunities elsewhere were lacking.

Wider challenges

Overall, this study found that labour scarcity was a less troublesome issue for the respondents than has been reported for UK agriculture in general, even among the farmers with dairy and horticulture enterprises. But the interviews revealed that the challenges of hiring non-family workers go beyond scarcity caused by such factors as unaffordable housing or a competitive labour market.

Several interviewees explained that the problem was not finding people to hire *per se*, but rather, finding “the right person”. Respondent 20 in Herefordshire had recruited a young man but he soon left for bigger farm with more machinery (“It’s what they want these days”). Previously, when her farm still had a dairy, they employed workers from Poland, but she found that they could leave suddenly and would not be available for the holidays. Interviewees expressed a lack of confidence that a new worker or student would be able to farm in the right way or show the same dedication that an owner or family member would. “They wouldn’t look after the cows the way we do,” said Respondent 32.

Survey respondents and interviewees often stressed that it was particularly *skilled* workers that they had trouble finding. Respondent 66 noted, “The thing is, when you are a one-man band, you don’t have time to teach anybody.” This supports comments made to a parliamentary committee in 2019 by Jo Bruce, a rural skills provider. Discussing the barriers to farm apprenticeships, Bruce said: “From a farming point of view, it is time. It is not cost…To have that one-to-one mentoring is really difficult from a farmer point of view” (Select Committee on the Rural Economy, 2019). Interviewees explained that it was difficult even for farmers with specialised enterprises to get the right balance between workers who were good with livestock and workers who were good with machinery; people with skills in both areas were highly sought after. As her dairy enterprise became more sophisticated and data-intensive, Respondent 404 from Wiltshire also observed that the relief workers they used were rarely skilled at both milking and data analysis. This meant that as well as their hourly rates being quite expensive, she was having to spend time and money addressing problems they had caused or neglected, such as mastitis.

Other challenges were linked not to specialisation but the need for personal or functional flexibility. Respondent 191, from Shropshire, was not interviewed but commented in the questionnaire. His was a mixed dairy farm with arable, beef cattle and sheep. He wrote, “Being intensive livestock farms [*sic*] with a wide range of jobs, it’s increasingly difficult to find employees with sufficient knowledge and interest with the willingness to work hard at all tasks.” For Respondent 524, also in Wiltshire, the difficulty was in finding people who were prepared to work only one or two days a week but be flexible enough to increase their hours at calving time.

Because of these experiences, many non-dairy farmers were reticent to recruit new workers, even when they acknowledged a need for extra help. There was also a pattern among LFA, lowland and mixed interviewees of failing to replace workers who left; often these were people who had been with the farm for many years and stopped working because of retirement or ill health. In economics terms, this demonstrates an elasticity in the farm workforce and imperfect responsiveness to their self-acknowledged demand for labour (Petrick & Zier, 2012). Rather than formally recruit a permanent staff member, farmers would sometimes take on someone temporarily or casually, and if that person was a good fit, they might stay on. For example, LFA respondent 245 from Shropshire had recently hosted a student on a long-term placement that the student, rather than the farmer, had initiated. While the student had greatly helped with the workload, the respondent had not officially planned to replace her, even though when asked how he would manage without her, he replied “I have no idea!”.

Another reason why interviewees hesitated to hire people, or decided not to replace departing staff, was the unaffordability of paid labour. Contractors were preferable, financially, because they could be used briefly for specific tasks. Interviewees were most confident in the viability of employing an extra person when they had a guaranteed new income stream, such as a milk vending machine or a Cost of Production contract with a supermarket. As the mastitis example of Respondent 404 shows, employing non-family members who are not familiar with the business engenders a cost not only through their wages but also in the time that the farmer needs to spend on supervision and training.

This means that in some interview cases, when a departing worker was not replaced for economic reasons, the remaining workforce was forced to manage the workload. The ways in which farmers manage to do this, by stretching their working hours, de-prioritising tasks or adjusting their systems, are explored further in the remainder of this chapter.

9.2.2 Adjusting the workload: mechanisation, system changes and postponements

This section reviews labour-saving adjustments that farmers in the survey made to their farming operations. These would be categorised by Sutherland et al. (2012:142) as *minor changes*: “an alteration to farming activities which does not change the direction or focus [of] the farm system”. Hostiou and Dedieu (2010) might classify them as examples of *organisational or system flexibility*. Labour-saving adjustments are an essential part of the modern livestock farmer’s ongoing drive to save time or paid labour costs and to make work easier, especially given the serious cost–price squeeze illuminated by the FBS (see Chapter 6.2.3). Adjustments may also be made in direct response to a growing or acute shortfall of labour caused by an imbalance between workload and workforce. A workload–workforce imbalance can occur after an increase in the workload, a decrease in the labour-input available or, in worst cases, both.

As noted, the questionnaire asked if farmers had recently made changes which had led to a decrease in their workload or labour requirements. Forty-seven (21%) respondents said they had (Figure 9.13). Some of the changes were made for non-labour reasons, such as when TB risks led farmers to decide to reduce their herds. Here, the focus is on changes that were made at least in part with the deliberate intention of responding to a workload–workforce imbalance or the need to control labour costs. The interviews suggest that the most common labour-saving adjustments are: downsizing or contracting out an enterprise; ceasing an enterprise completely such as selling the sheep flock; making changes to the production system; using equipment and IT; postponing certain tasks; and either changing the route to market or leaving a certification or farm assurance scheme. The remainder of this chapter section is devoted to exploring some of these labour-saving adjustments in more depth.

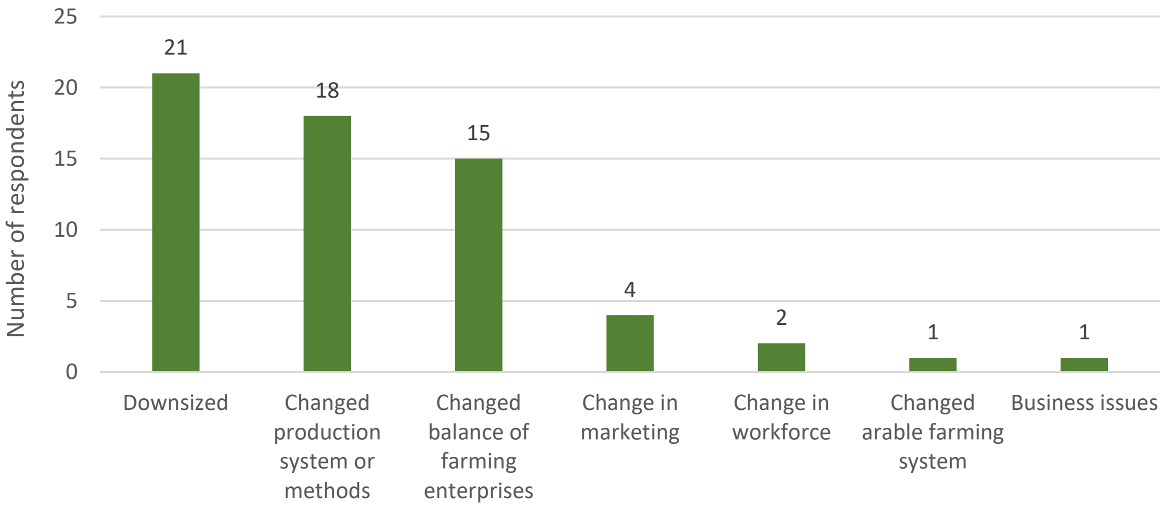


Figure 9.13. Summary of respondents' answers to the question, 'Have you made any significant changes to your farming system or marketing in the past 2–3 years which have decreased your workload or your need for workers or contractors?' (*n*=47)
Data source: survey dataset

9.2.2.1 Equipment, infrastructure and IT

Nineteen of the survey respondents, including 15 who were interviewed, listed the use of labour-saving equipment, infrastructure or IT. The most common labour-saving technology are handling systems for sheep or cattle. Several of the dairy farms had automised some of their indoor systems, such as with automatic feed pushers. Four of the adjustments were substantial improvements to barns or milking parlours that are likely to have been very expensive, as was the purchase of a min-till cultivator by a mixed farmer to reduce his cultivation costs. Mostly the adjustments appear to have been funded by the farms, although one respondent mentioned that they had borrowed a sheep handling crate from a friend.

Figure 9.14. Example of a mobile sheep handling system
Source: https://lmbateman.co.uk/product/bespoke-handling-systems/

Use of the most advanced technological solutions, linking equipment to software, was confined to five dairy farms and one mixed farmer. Respondent 32 had invested in robotic milkers, financed by a bank loan. The decision, he said, was prompted by the departure of a long-term parlour worker and his own increasing years. Given the costs that would have been involved in recruiting, housing and training a replacement worker, he and his family decided that robotic milkers would be more cost-effective: "We looked at buying a house in the local town, we looked at labour, we looked at robots, and we did our sums." Automatic milking can create new types of work for dairy farmers (Hostiou et al., 2020). Respondent 32 admitted that the system sent him alerts and data to analyse, but said the workload was manageable, helped by remote support from the robotics company. "Yes, there are calls in the middle of the night, but one accepts it… one gets out of bed, dresses and goes to the robot." Two dairy farmers extolled the virtues of automatic cattle sorting gates, linked to EID tags in the animals' ears, which they said had reduced the time needed for moving cattle and recording data. "It's like having someone with a clipboard who is accurate 99% of the time" (Respondent 210).

Only one LFA farmer from either the survey or the interviews mentioned having made a change of this type (they acquired a new sheep handling system). None of them had availed of the potential of compulsory EID tags in sheep for improving flock management, perhaps because of the aversion to smartphones and computers observed in many of the LFA farmers in the sample. In comparison with dairy farms, the UK's beef and especially sheep farms have tended to do – and to be asked to do – less data analysis. A 2015 survey of 439 farmers in England and Wales found only 21% used sheep EID data for farm management purposes (Lima et al., 2018). It is not just that beef and sheep farmers have faced fewer external requirements. Their low financial returns may also preclude investment in potential improvements on the farm (Northern Upland Chain Local Nature Partnership, 2016), which could include infrastructure and IT. Research among Welsh sheep farmers also identified that the cost of technology was a barrier to its adoption, along with poor communications links in rural areas and age and low formal education of farmers (Morris et al., 2017a).

9.2.2.2 System and business changes

System changes

The other component of the 'Farming systems and techniques' category shown in Figure 9.14 is adjustments that farmers made to their production systems to make them less labour-intensive. There were more LFA respondents represented here, although they still make up only three of the 18 respondents who mentioned such adjustments in the survey or interviews.

The most common system adjustments involved lambing: either moving from indoor to outdoor lambing or condensing the lambing period into tighter blocks. Other changes included scheduling calving to either condense or spread out the labour demand; deciding to either sell youngstock earlier or buy stores instead of rearing lambs and calves; and several improvements to grazing systems that are discussed in Policy Case Study 2. Interviewees mentioned further changes, including using sexed semen to avoid male calf-rearing and keeping less labour-intensive breeds.

Often, farmers made such changes for several reasons, not only labour-related. For example, Respondent 73, who had tried outdoor lambing before giving up sheep completely, was also motivated by limited shed space and an aim of improving health outcomes for ewes and lambs.

Older farmers who had been farming a long time had perfected their systems over time, but there could be tensions when the younger generation wanted to make changes. Two respondents who had established their own businesses quite recently rather than take over from a parent, described having the freedom to design their production systems from scratch, tailored not only to the land and infrastructure but also to their preferred working hours, and this seems to have helped to create workloads that were manageable for them. Another respondent said he had learned to become more efficient since his parents had passed away and left him as the only full-time worker:

> Researcher: "What things have you done to save time and cut down on your labour?"
>
> Respondent 66: "It's being used to having a routine. I can feed 130 cattle and bed them down in 1 ½ hours on my own. It's just a routine that you get into."

9.2.2.3 Postponing work

A less dramatic way of making workloads more manageable is to postpone certain tasks. In the questionnaire, 40 respondents said postponing planned work helped them to respond to a labour shortfall (22% of those who answered). This included 38% of the smallholders who answered the question, 25% of the dairy farmers, 23% of the mixed farmers, 23% of the LFA farmers and three (20%) of the lowland farmers. Thus there is no farm type that reported this strategy more than others, although it is notable that smallholdings were the most likely to say they postponed work, perhaps because their output is not business-critical.

Three of the respondents who selected this answer were interviewed, and they explained that the kinds of work they would put off when busy were maintenance jobs such as fencing and livestock health jobs in their health plans that were recommended but deemed optional.

> Researcher: "What is it that gets postponed when you are stretched?"

> Respondent 245: “It’s the general repairs and maintenance that doesn’t get done – buildings, gates…Non-essential work.”

During the interviews other respondents also described postponing work, suggesting that the practice is more common as a coping strategy than the questionnaire found. They included some of the farmers who admitted postponing paperwork at busy times and then needing to catch up before an inspection; and farmers who did not implement rules under Red Tractor that they deemed non-essential. Conversely, dairy farmer 395 said that an increase in paperwork had caused him to postpone other jobs, mainly because his bad eyesight forced him to do the paperwork during the day, when he might otherwise be outdoors. It is an example of how administrative requirements can take time away from other parts of farming if they cannot be managed through overtime at night, multi-tasking (often requiring a smartphone) or delegation.

9.2.3 Adaptive capacity

Most of the interviewed respondents used a combination of adaptive mechanisms. They and other members of the workforce employed stretch – that is, they worked long hours – to absorb additional labour demands. They made use of flexible labour to cope with workload peaks; and they made adjustments to the production system and farm business to reduce the workload and adapt to either a decline in labour-input or constraints on their ability to acquire labour such as recruitment difficulties or affordability concerns. Some of the most useful workload adjustments were labour–technology substitution, organising calving blocks or practising outdoor lambing, using sexed semen to avoid male calf-rearing, and keeping less labour-intensive breeds.

The ability to absorb and adapt is affected by the farm’s adaptive capacity (Milestad et al., 2012). In addition to employing adaptive mechanisms, a farm’s capacity to adapt to labour pressures appears to be affected by deeper adaptive factors. These relate to the characteristics of the farm and workforce members. Farms that can access financial capital to pay for minor changes such as labour-saving equipment, the services of a bookkeeper or increasing an employee’s hours from part time to full time are at an advantage. Another factor is the principal farmer having family members who are available to help on the farm. Some respondents clearly benefit from being IT-literate, or from having someone in the family or workforce who is; this has enabled them to adapt to the changing nature of paperwork and information-gathering that livestock farmers face. An influential geographical factor is being located in a mild climate, which allows farms to control labour costs by outwintering cattle or lambing outdoors in spring.

There are also some personal characteristics discernible among respondents that might influence their adaptive capacity. Some of the respondents with young children or grandchildren had made a conscious decision to pursue a healthy work–life balance; they were less likely than other respondents to adopt a strategy of working very long hours and adopted alternative mechanisms. Two respondents (435 and 524), one from a military background and other who had worked in an office, had a predilection for administration and compliance which clearly helped them to manage farm paperwork. Another example might be the willingness of Respondent 235 to attend computer classes and respondent 32 to learn robotic milking software, when other farmers of similar age (semi-retirement) avowed not to touch a computer. This had helped the two respondents to manage their paperwork and shift to robotic milkers, respectively.

The absence of adaptive factors or the inability to use certain adaptive mechanisms could be seen as constraints on a farm's adaptive capacity. The findings suggest that, unsurprisingly, farms with larger workforces and potentially greater access to capital (e.g. a large dairy farm) are better able to turn to strategies such as reallocating labour or paying for emergency additional labour than smaller farms with less diverse enterprises and less capital available (e.g. a medium-sized sheep farm), where adapting by stretching the existing workforce might be the only option available.

9.3 Transformational change

Farmers may respond to labour pressures, perhaps after a period of absorption and adaptation, by making a substantial change that transforms the workload. This is the third stage depicted in Figure 9.1. These were what Sutherland et al. (2012:142) call *major changes*: "a change in farming trajectory", which they define as a change of such magnitude and complexity that it moves the farm from its current trajectory; something that involves a deliberate and substantial change in the use of farm resources.

Several farmers in the study had relieved pressure on the workforce in recent years by reducing the size of a farm enterprise (recall Figure 9.13). Three respondents had sold their sheep flocks and two more had substantially reduced sheep numbers. Six more respondents had sold or reduced their suckler herds. Other farms had left dairying and many more respondents were considering downsizing. In the questionnaire, downsizing was the most common reason given for a recent decrease in workload or labour demand. Three more respondents said they had reduced their workloads in recent years by contracting out an entire enterprise.

The reason for these changes were not always given but in at least six cases, labour issues were a contributing factor. Sometimes, the enterprise did not make enough money to cover the labour costs. Poor financial returns are clearly a strong driver. This is reminiscent of the actions taken by farmers in New Zealand in the 1980s when they needed to cut costs after the removal of subsidies (Reynolds & Sri Ramaratnam, 1990; Wallace, 2014; see Appendix 6). Sometimes the change was made because the workforce had shrunk and could no longer cope. Ageing is also a factor, with some farms downsizing to reduce the workload to match the reduced labour-input that they were prepared or physically able to provide. Labour scarcity does not often seem to have figured in many of the decisions, but at least one of the farms that quit dairying had experienced persistent difficulties recruiting dairy staff.

Downsizing could be interpreted in a negative light as a distressed response to crisis or a half-hearted retirement strategy. Perhaps downsizing should be interpreted in a more positive way, as a reasoned strategy to bring the workload into closer balance with the labour-power currently available. In their report *Less Is More*, Clark and Scanlon (2019) argue that it makes economic sense for upland livestock farmers to reduce livestock numbers to the maximum carrying capacity of pasture alone, so that they can farm without costly inputs. Downsizing gives the farm business a chance to remain in operation. Perhaps, given the ebb and flow of farm businesses over time (Darnhofer, 2021), the operation may be expanded again when a younger generation with greater access to labour power, capital and new ideas takes over. Some farmers who were not retiring had downsized the livestock numbers but increased an off-farm activity which earned better returns to labour.

Making major changes can have a dramatic impact on the farm workload and the hours of core workforce members. Many of the transformational decisions had succeeded in relieving pressure on the farm workforce. Some of those who had left dairying had shortened their working hours, such as Respondent 66, who said that despite working long hours at lambing and calving time, everything felt easier relative to when he was milking twice a day, seven days a week. Respondent 73 had sold his flock of "a few hundred" ewes, retaining a small suckler herd, whose offspring fetched decent prices as stores at market, and a contracting business. Selling the sheep had transformed his life, he said: "I was doing phenomenal hours before… Now, I still get up early, but I choose to." It had also freed up land for him to start growing cereals for cattle fodder, thus reducing input costs; and he used the proceeds from selling the sheep to buy labour-saving equipment such as a diet feeder (Figure 9.15).

Figure 9.15. Example of a silage feeder as purchased by Respondent 73

Source: TechnoMoffat Agriculture Photography (2018)

9.3.1. Facilitating factors

In November 2020, UK agriculture minister George Eustice sparked annoyance in the farming community by suggesting that mixed farmers could switch from sheep to cattle if lamb exports were affected by Brexit. The National Sheep Association protested that for producers such as upland sheep specialists or lowland farmers grazing sheep on short-term leys, this would be impossible. Its Chief Executive commented that "[many] farmers… have structured their farms to focus on sheep" and that in parts of the UK, "buildings, machinery and farm infrastructure simply would not suit a sudden switch to cattle farming" (NSA, 2020).

In this light, it is interesting that the study respondents who sold their sheep flocks or suckler herds already had at least one other enterprise. That is, they were not shifting from one enterprise to another; they were streamlining the farm business and making it less diversified. One of the farmers who left dairy did start another enterprise (turning their dairy herd into a suckler herd for beef production); but he had most of the infrastructure already in place and the new enterprise would not have required much if any financial investment. Respondent 73 (see below) used the money he got from selling his sheep to invest in labour-saving equipment for his remaining beef enterprise.

The interviews suggest that, as with a farm's adaptive capacity, its transformational capacity is influenced by a set of facilitating or constraining factors; by a similar combination of luck and design. For example, other than downsizing or leaving dairy, major changes in the farm business often require additional labour and financial capital. Several interview and survey respondents also reported major changes to the farm business for reasons that were not directly labour-related (see Table 9.5). A common theme in these cases is having access to financial capital to enable investment in new equipment and infrastructure. Therefore, if a workforce–workload imbalance is caused by unaffordability or unavailability of labour, then the farm might not be able to raise the capital needed to solve the problem by making a major change.

Respondent 389 had overseen a considerable change in resource use in the family farm in recent years, with an increase in labour for intensive rotational grazing, a specialisation of labour within beef production and the hiring of new labour for a direct selling enterprise. His ambitions were facilitated by access to capital, his IT literacy and access to family labour. The most recent change had been to contract out the summer field operations, which was done to relieve some of the pressure on his workload, since he had a relatively inflexible part-time job to accommodate. Respondent 389 was now in the 'consolidation' phase described by Sutherland et al. (2012:147) in their triggering change model, when "the utility of the new approach is evaluated". Using contractors had freed up labour-time but he had been reviewing the figures, he said during the interview, and concluded “we have produced some very expensive silage this summer”. It is a difficult balance, he observed, to cut fixed labour costs but avoid excessive spending on outsourced labour. This example highlights the centrality of factors of production in farm-level strategies, even when personal ideals and aspirations guide the way forward.

9.3.2. Reflecting on the change process

These are not easy changes for farmers to make, which is partly why George Eustice’s comments aroused anger. The interviews suggest that members of the farm business would sometimes consider a major change for years, during which time pressure on the labour system could build, before making the leap.

In Sutherland et al.’s triggering change model, a sequence of events is proposed in which the farm decision-maker experiences one or more triggers and decides to make a substantial change to the system. This point of realisation is the ‘trigger event’. Next, the decision-maker enters a period of assessing options before choosing what to do and implementing their decision. When respondents recounted transformational change in the interviews, the process was a little different. For them, the pivotal moment was not deciding that change was necessary, but **deciding on a particular course of action**. That point was clearer in farmers’ minds and easier to identify. It was preceded by an often lengthy period of reflection, while farmers would notice triggers or begin to plan for triggers to come, at the same time as starting to assess their options (see Table 9.5).

Sutherland et al. propose that major changes in farm businesses result from the conscious choice of the principal farmer or farm manager, who takes an explicit decision to change in a single, definable moment.[16] The interviews suggest that this is an oversimplification if taken literally, since big changes on the farm were often a joint decision made by two or more business partners or family members.[17] There were sometimes disagreements about the future direction of the business, and changes could be launched alone by members of the family who would not be considered the principal decision-maker. The interviews also revealed that some changes were brought about by external forces, such as when tenants were sometimes forced into making major changes by their landlord. This is a contingency not included in the Sutherland et al. model.

When they begin to consider making a change, farmers do not know if a major system change will be required or if something more minor will be enough. The findings from interviews support the observation made by Darnhofer in her model (2021) that whether a change is minor or major is

[16] Sutherland et al. explain that they purposely designed the model like this to give farmers a more active, less passive role in explanations of change.
[17] Sutherland et al. acknowledge that “the potential that different individuals, and therefore values and objectives, influence… decision-making is an area for further research” (p.148).

often not apparent until after the fact and is not always planned at the time the change is made. Sometimes, respondents described how a minor change had bigger than expected impacts. For instance, Respondent 213, a dairy farmer, began using sexed semen to reduce the number of male calves being born. Unexpectedly, this led to the farm producing too many female calves, and so they developed a new marketing channel for the heifers. Or, it can happen that farmers start making small adjustments which lead to something more impactful for the direction of the farm. As an example, Respondent 131 started on a path to regenerative agriculture by mob grazing some of the farm's sheep flock. When that proved viable and he had convinced his father, they started mob grazing the cattle too. The family were now planning to put the farm into organic conversion.

For Sutherland et al., it was important to distinguish between making a conscious, major change and more incremental minor changes, because they developed their model in the context of understanding adoption of agri-environmental measures, which is typically presented as requiring a substantial shift in the farm's trajectory if it is to have meaningful impact. However, the present study is less interested in what brings about a particular kind of *outcome*, and more interested in all kinds of change that result from a particular kind of *trigger* (i.e. labour pressures and external requirements). Whether the change leads the farm to follow a new trajectory is not the focus of enquiry.

Overall, Darnhofer's flow of change model (2021; see Chapter 4), which makes less of a distinction between major and minor change and emphasises adaptive adjustments and the unpredictability of change, was more fitting than the Sutherland et al. model to the respondents' stories.

Table 9.5. Summary of major changes reported by interview respondents, using Sutherland et al. conceptual framework
Source: telephone interviews

Respon-dent	Major change	Triggers	Any triggers directly labour-related?	Decision-making process	How farm resources, priorities and networks were affected	Facilitators of change
20	Gave up dairy enterprise and launched tourism diversification enterprise	Unknown	Unknown	Unknown	Loss of paid labour; loss of dairy herd; reallocation of family labour to diversification; left dairy supply chain network; new connections with tourism agency and visitors	Unknown
32	Installed robotic milkers	Anticipating difficulties recruiting a replacement full-time worker linked to cost of housing and fears that a new worker would not stay long; planning for retirement	Yes	Decision taken by core family unit after assessing options	Labour–technology substitution. Robotics company became an important source of advice and support	Access to capital (bank loan)
52	Reduced sheep flock, changed grazing regime, replaced cereals with pasture	Part of farm's land was taken away by landlord	No	Decision made by landlord abruptly; farmers had to quickly decide what to do and develop ways to adapt	Decrease in land and livestock; increased labour demand; need to purchase hay	Ability to downsize business but still keep it going; able to pay for new fencing and handling system
53	Downsized then re-built suckler herd from homegrown stock	TB breakdown	No	Decision largely forced upon farm	Loss of cattle; new focus on breeding replacements	Income from sheep while recovering from TB losses
66	Gave up dairy enterprise and built up beef suckler herd	Milk price was too low, milking parlour needed updating, farmer's mother died and his children would not be old enough to help on the farm for several years	Yes	Decision taken by principal farmer after cumulation of triggering events	Change in nature of work; deceased working hours; loss of dairy cows and left dairy supply chain network	Personal flexibility; keeping some cows for suckler herd made transition easier
83	Reduced beef herd, increased sheep flock and expanded horse livery enterprise	TB breakdowns; beef farming was not financially viable	No	Decision taken by principal farmer after unknown triggering period	Reallocation of labour to other enterprises; loss of cattle	Mixed farm provided other income sources

73	Sold sheep flock	Ageing and poor health; volatile market and poor financial returns for the amount of work involved; changing to outdoor lambing hadn't solved problem; desire to see grandchildren more often	Yes	Decision taken by husband and wife after cumulation of triggering events	Reduction in workload; loss of sheep; suckler herd became sole priority	Have been able to improve price fetched at market for cattle by selling them earlier as stores
131	Adopted principles of regenerative agriculture including mob grazing sheep and cattle	Need to improve financial margins; personal interest	No	Change instigated by farmer's son; father needed persuading; built on experimental phase with sheep	Investment in equipment; change in workload and nature of work	Son accessed online networks for information and advice on regenerative agriculture; able to pay for new fencing and handling system
146	Began mob grazing sheep and cattle	Need to improve financial margins; personal goal of becoming more efficient	No	Change instigated by farmer's son	Investment in equipment; change in workload and nature of work; joined a grazing research network	Son's university education; support from AHDB; access to capital from elsewhere in business for infrastructure; personal flexibility of son
181	Began selling milk from a vending machine	Unknown	Unknown	Unknown	Increased income but also increased workload; developed network of local customers	Had a suitable site on the farm; organic status helps marketing
189	Increased cow numbers and began mob grazing	Opportunity to improve system and pasture quality	No	Unknown	Increased cattle; other effects unknown	Unknown
200	Began selling milk from a vending machine and direct to shops	Unknown	Unknown	Unknown	Required increase in labour and reallocation of principal farmer's time; added to workforce; developed network of local customers	Access to financial grant; large workforce for absorbing initial increase in workload
210	Expanded dairy herd, changed sheep breed and moved to outdoor lambing, and acquired new land	Financial planning identified opportunity to improve income; arrival of new business partner with dairy skills; landlord withdrew some land	No	Decision taken by business partners after assessment period; partly forced by landlord	Farm business became more capital-intensive; unclear how labour demand was affected	Access to capital for expansion and electronic sorting gate; other grazing land was available

243	Decision to go into share farming or, failing that, to downsize livestock numbers	Ageing and finding hill farming physically hard work; no children to take over the work; wish to help new entrants	Yes	Decision taken by husband and wife after long period of reflection	Change not yet implemented	Change not yet implemented
364	Sold dairy bulls, started breeding using sexed semen only and built new shed to keep bull calves	TB breakdown	No	Unknown	Unknown	Access to substantial financial capital for new shed
386	Downsized and sold suckler herd, to focus on buying and selling store cattle	Anticipating retirement; work gathering cows for artificial insemination was physically difficult	Yes	Decision taken by principal farmer after cumulation of triggering events	Freed up time of principal farmer	Small operation and no debts
389	Adopted eco-extensive principles and practices including mob grazing, began selling beef at the farm, reorganised division of herd and farm enterprises	Need to improve financial margins; personal goal of becoming more efficient	No	Unknown	Shifted business focus more towards diversification; re-division of labour within the core family unit; increased paid labour and developed network of local customers; joined eco-extensive network	IT literacy; other farm enterprises provided money and infrastructure; access to additional capital for new grazing infrastructure; working in a family setting
395	Sold sheep flock, reduced dairy and suckler herds, and changed to a closed herd rearing own calves	Father died and long-term worker retired; TB risks; long-held personal dream to have a closed herd	Yes	Decision taken by husband and wife after cumulation of triggering events and period of reflection	Increased feed costs for calves and youngstock; changed workload; reduced income	Wife of principal farmer gave up off-farm job; death of father liberated son
404	Gave up dairy enterprise	Landlord not supportive of dairy enterprise; difficulties recruiting workers with required skills; disagreements within the family and retirement of father-in-law	Yes	Decision taken by principal farmer after cumulation of triggering events; partly forced by landlord	Dairy staff given new roles; other effects not yet evident	Unknown; replacement enterprise(s) still being implemented
432	Secured valuable Cost of Production contract with supermarket	Contract was offered to farm, which was already a high-performing supplier; desire to improve financial margins	No	Unknown	Increased data capture and paperwork; higher income allows farm to use more self-employed workers; joined supermarket producer group	IT literacy; confidence from prior membership of Eblex producer group

10. Stretchedness, connectedness and breaking points

The findings in Chapter 9 support this study's hypothesis – linked to Research Question 3 – that farm labour systems have a degree of elasticity which enables them to respond to fluctuating demands for labour-time. The second hypothesis of this study, however, is that some farms reach a threshold or breaking point where the farm labour system can no longer stretch and the farm must make a change. The chapter presents evidence to suggest that this does sometimes occur, and discusses the appropriateness of using Sutherland et al.'s triggering change model to describe this process. For a recap of these ideas, the reader is redirected to Chapter 2, section 2.4, and Chapter 4.

This chapter also argues that some farms remain stretched because they lack the resources or capacity to make a change. It explores the farm-level and farmer-level characteristics that contribute to farm labour systems becoming and remaining stretched.

The chapter ends by returning to external requirement schemes. It is proposed that the labour pressures of schemes can contribute to a breaking point, although are unlikely to trigger a change by themselves. Some farms have responded to the pressure by leaving a scheme, but an argument is made to support the study's third hypothesis, which is that market inequalities and the discursive legitimisation of over-work make it difficult for livestock farmers to leave schemes despite the administrative burden and stress that they sometimes cause.

10.1 Reaching breaking point

Having workforce elasticity is a resilience strategy that helps livestock farms absorb labour pressures, but it does mean that many livestock farms are operating under a certain amount of strain. Workforce members may be working very long hours at times, and farmers might be finding the nature of work stressful because they do not have the skills or resources to do it easily. Workforce elasticity comes at a cost.

Also, there is a limit to which stretching the workforce can meet all of the demands that a farm encounters. Despite stretching, some farm workforces are not able to fully manage the workload. Respondents described postponing non-urgent tasks or not being able to comply with all recommended actions in their livestock health plans, for example. And the interviews show that it is not only stretching hours that causes a member of the workforce to feel stressed. Farmers may feel stressed when they find aspects of farmwork difficult, dangerous or unenjoyable. Many livestock farmers were hampered in their efforts to adjust to the way that farmwork is changing by a lack of IT skills and not always having an experimental, scientific way of working. Not being able to find suitable personnel for the workforce, or having disagreements among workforce members, also put a workforce under strain. The farms that have a low capacity for stretch – for example, they do not have access to family members to help at peak times or they cannot use online systems easily – could come under greater strain than the farms with higher capacity. At the risk of mixing metaphors, workforces with the least stretch can become the most stretched.

The interviews revealed six cases where the farm labour system reached some kind of breaking point. They were two LFA farms, one lowland farm and three dairy farms:

- LFA respondent 109 described reaching a breaking point five years previously after several years struggling with the labour demands of indoor lambing, culminating in a particularly difficult lambing season. The work was time-consuming and hiring labour was too costly. Respondent 109 concluded that “something had to give” and decided with his brother to change to outdoor lambing.
- Respondent 243 operated an extensive upland beef and sheep farm with a part-time paid worker and help from her husband at weekends, as well as contractors and occasional help from other farmers. Various pressures had increased the workload, including drought hindering her grazing regime and an increased administrative burden – caused in part by her pedigree breed society and the RPA. But the main factor that had pushed her farm labour system to breaking point was ageing and simply finding the physical aspects of upland livestock farming too hard. She and her husband had decided to find a younger farmer to take over some of the work in a share farming agreement or, failing that, to downsize.
- Respondent 376, who worked on a specialist lowland beef farm, said that working very long night-time calving shifts had led to burnout a few years previously. She had subsequently decreased how often she checked the cows at calving time. “Now I do what I can, and if I can’t run any more, then good luck.”
- Respondent 189 said his labour system had reached “breaking point” (a phrase he used himself) in his dairy business three years before. The main cause was a small and outdated parlour, which made the job of milking time-consuming and hazardous for him and his staff. It reached a point where it was “stress testing us and the business”, he said, and so the respondent invested in a larger herringbone parlour with more automation. This had freed up time and made working safer.
- Former dairy farmer Respondent 404 had sold the dairy herd since filling in the questionnaire, and was reorienting her tenant farm business. In her case whether the farm workforce reached breaking point is more open to interpretation. The problem was not

that workforce members were working excessively long hours, rather that Respondent 404 encountered persistent labour shortages and difficulties recruiting workers with the required skillset, leading to some errors being made. This chronic labour issue was a major factor in her decision that continuing in dairy farming was no longer viable.

- Fellow dairy farmer 210 is another example of where it is difficult to judge how stretched his labour system was before he made a change. But the farm workload had increased because of Arla's requirement to rear male calves for longer, and this had put the workforce under strain. He resolved the situation by increasing a staff member from part time to full time. When asked if they were stretched before that point, Respondent 210 said, "Yes, we were a bit."

For each farm the direct cause of the breaking point was different: a combination of excessive hours; physically difficult work; an inadequate working set-up; and not being able to recruit the right staff. The problems had arisen over a relatively long period of at least a season and usually longer. But each farmer had reached a point where the situation felt intolerable and a change was needed.

10.1.1 Applying the triggering change model

Sutherland et al.'s triggering change model is very useful for thinking through how labour pressures can build up in a workforce and the processes by which change (to relieve that pressure) comes about. However, from the analysis it became clear that the 'trigger event' in the Sutherland et al. model is not directly analogous to the breaking point described by some interview respondents. Sutherland et al.'s model of major change in a farm business trajectory cannot be neatly transposed to the situation modelled in this study of a farm labour system responding to negative pressure.

Sutherland et al. define a trigger event as a moment when the farm decision-maker realises "that system change is necessary" (2012:144). That moment is caused by an unusually significant event, or series of events (which could be negative or positive). It results in the farmer making a major change to the farm business. The implication is that minor changes of lesser magnitude are usually made under less extreme conditions (see Figure 10.1). In three of the examples described above, however, the farmers responded to a breaking point by making changes that would be defined as minor in the Sutherland et al. model: changing from indoor to outdoor lambing, reducing nighttime hours during calving and updating the dairy parlour. Reaching breaking point was not a sufficient trigger to force a change in the trajectory of the farm business. Only two of the respondents had decided to make a major change (leaving dairy and seeking a change in farm ownership).

Conversely, other study respondents described making major changes when their labour systems were not particularly stretched or stressed. They may have experienced triggers as proposed in the Sutherland et al. model, but a breakdown in the farm labour system was not one of them.

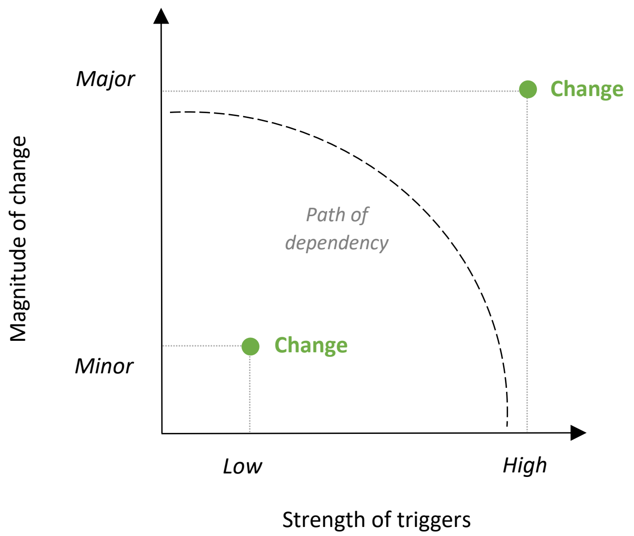


Figure 10.1. Schematic representation of Sutherland et al.'s triggering change model (2012). Major change only results from significant triggers, which force the farm system to break through path dependency
Created by author

The concept of breaking point

The concept of a breaking point was developed for this study's conceptual framework as a logical extension of the starting assumption that a farm labour system has elasticity and can stretch.

The concept implies that when the system is stretched too far, it breaks down and can no longer function. However, the interviews show that it is the farmer who reaches breaking point, not the system. Farmers almost always have a choice in what happens and how far they will allow their systems – or their own personal working hours – to stretch. There are times when a labour system does fail and the farmer must respond because the existing system simply cannot function. For example, there may be a sudden injury or illness of a workforce member. But the interviews suggest that more often, the pressures on a labour system are gradual and the point at which change becomes necessary is not clear-cut.

Some respondents had made changes to relieve labour pressures, but they did not seem to have been at a full breaking point in the sense that the situation was not yet untenable. There were some cases when a farmer made a major or minor change in anticipation of problems such as ageing or recruitment difficulties, to avoid their labour system from coming under strain in future. Other farmers seemed stretched but the pressure had not yet triggered a change; the farmer was just enduring it and perhaps contemplating making a change in future.

Perhaps, if the hypothesis of a breaking point is to be useful, it should be understood in a more positive way as an empowering moment at which a farmer escapes or transforms a situation. The farmers who are stretched but do not reach a breaking point, could be in a worse situation than those who do. They might lack the resources to make an adaptive or transformative change. If and when a farmer reaches breaking point, therefore, could depend on the farmer's willingness to endure the consequences of a stretched workforce (e.g. long hours, postponed jobs, errors) and also their capacity to do something different.

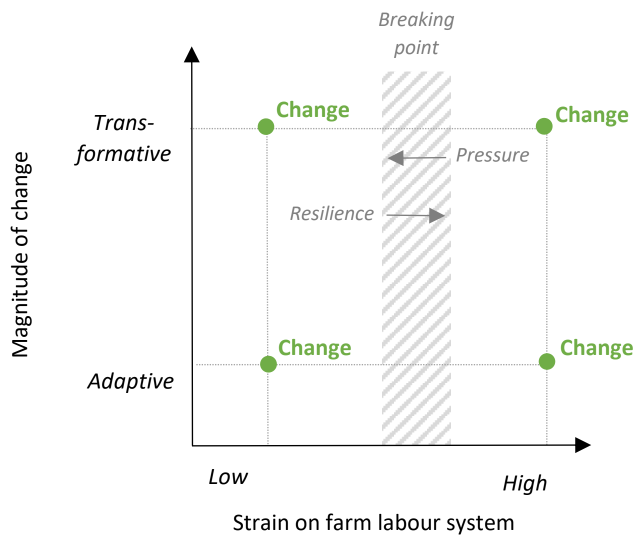


Figure 10.2. Adaptation of Sutherland et al. model to fit research findings. Major (transformative) or minor (adaptive) changes can occur whether farm labour system is under high or low strain. Labour pressures bring system closer to breaking point; resilience capacity keeps breaking point at bay
Created by author

Conceptualising a breaking point in this way would be consistent with the observation made by Sutherland et al. that making a major change can take substantial resources of financial and human capital. (See Table 9.5 in section 9.3 above for evidence of capital facilitating major changes.) It would also fit with the ideas in the resilience literature that making a transformative change can be ultimately better for the farm business than just absorbing pressures. Figure 10.2 attempts to illustrate the idea that minor (adaptive) or major (transformative) changes can be made at any point, and that a farm's breaking point is delayed by resilience but hastened by labour pressures.

10.2 Stretched farm labour systems

It was argued in the previous section that some farm workforces can become excessively stretched, in the sense of being over-worked. This was the condition of over-employment that was hypothesised at the start of the study. The interviews showed that farm labour systems can become strained in other ways, too, such as farmers becoming stressed by the nature of the work or not being able to meet their workload. The strain led some respondents to make a change, before or after reaching a breaking point.

But is it possible to conclude that some farms are more likely to become stretched than others in the first place? Here, a set of farm characteristics are proposed which seem to be risk factors for what we might call *stretchedness* of the farm labour system. It is argued that stretchedness is interlinked with another aspect, named here as *connectedness*.

First, an attempt was made to identify any particularly stretched respondents among the 34 interviewees. The assessment was based on any signs of overwork or labour strain among respondents, such as working very long hours or lacking the time to do jobs, and any signs of stress, such as the respondent feeling overwhelmed by paperwork. Some respondents were asked directly in the interview if they felt stretched. With so many respondents reporting that they worked long hours but were just about coping and happy with their work, it is difficult to assess how many of them are operating under stretched conditions. It is also not possible to wholly assess the wellbeing of an entire farm labour system by interviewing only a single member of the workforce. Therefore the assessment of stretchedness is based on the respondent's perception of their situation and the researcher's interpretation of the farmer's description. With those limitations in mind, 12 respondents were identified as very or somewhat stretched. They include:

- Respondent 20 had a mixed beef and arable farm, having previously left dairy. The workforce comprised her, her husband and seasonal contractors, with no family members. She was very stressed by paperwork from multiple sources – "it is quite overwhelming" – and the absence of available support. The pressures on the workforce side were a lack of family to help out and difficulties recruiting paid workers which left their system feeling under-manned at times since they let their full-time dairy staff go.

- Respondent 146 was a young man who worked on a diverse mixed farm with his parents. He did not express stress over paperwork, which was mostly handled by his mother, but reported working very long hours, especially at peak times in the year. For him, difficulties were being caused by the farm business being overly diversified, creating diseconomies of scope[18] and disagreements within the family over work. Although he found it ultimately beneficial, adopting intensive rotational grazing had added to his workload. He thought the farm needed to hire some part-time labour to help share the load, but he and his parents were resisting this apparently for emotional rather than financial reasons.

[18] The respondent described a situation of labour inefficiency on the farm caused by "spending too much time setting up for multiple tasks for small numbers [of livestock]", which could be an example of diversification adding to management costs and thus creating diseconomies of scope (Rawley & Simcoe, 2011; Arai and Morimoto, 2016).

- Respondent 200 was a dairy farmer who was well staffed and appeared highly organised, but nevertheless expressed uncertainty that the farm labour system would be able to cope going into the busy winter season with autumn calving, calf rearing and winter housing. Her workload pressures came from recent diversification into direct selling, which had taken much of her husband's time, and difficulties with the RPA. On the workforce side, labour-input had been interrupted by staff illness and Coronavirus affecting their usual reliance on volunteers, leading her to conclude: "We are managing but we're on a bit of a knife edge."
- Respondent 245 did not express feeling stressed, but the labour system seemed stretched and certain jobs were being postponed. His elderly father was slowing down and his wife had to combine helping on the farm with a salaried job. Respondent 245 was having to learn to keep high-maintenance pedigree sheep with minimal antibiotics and paperwork was a burden, especially documents and blood tests for the pedigree breed society. Sometimes he found himself working at the computer until 10 or 11 at night. He did get help from contractors and a student but a combination of financial limitations and preference to be independent stopped him from hiring more labour.
- Respondent 376 had reached a personal breaking point some years previously, as mentioned above, but the labour system of the farm where she worked still seemed under pressure. The workforce was strained by the very large, extensive nature of the suckler beef production system, which created a heavy workload. It was a tenant farm, and the landlord created some unpredictability, which was stressful. But the absence of an obvious decision-maker and of a healthy work–life balance among staff also led to overwork and unhappiness. Respondent 376 said, "I have realised that we allow ourselves to work too hard." When asked if the system felt stretched, she said, "Yes, we are. Everyone knows that. I wonder… if we could be organised better. We waste time on bickering among ourselves."

10.3 Risk factors

The characteristics of the 12 stretched respondents and their farms were reviewed closely. They were compared with seven respondents who seemed unusually relaxed and the remaining 15 who were somewhere in the middle. The results suggest that there is not a particular farm type or farm size that is most susceptible to becoming stressed or over-stretched. Also, since the presence of risk factors changes over time, it is more accurate to say that any one farm can be more susceptible to becoming stretched at certain times than other times. Nevertheless, there are certain characteristics of farm businesses that seem to increase susceptibility to strain, especially if they occur together (Box 4). More research would be needed to give confidence to the findings.

Box 4. Risk factors for farm labour systems becoming stretched or stressed

Fundamentals	Additional elements	Workforce pressures
Indoor lambing	Direct selling	Small core workforce (less than 3 people)
Year-round calving; calf rearing	Diversification	No help from family at regular or peak times
Cattle in high-risk TB zone	Mob grazing	Low relative FTE
Mixed farming	Multiple schemes	Ageing
Challenges with location or land	Stewardship	Sudden illness or injury
Difficult landlord-tenant relationship	Pedigree breed society	Not IT-literate and no help from someone else
Machinery or infrastructure dilapidation	External requirements	Recruitment difficulties

The possible risk factors can be categorised into three rough groups. First, **fundamentals of the business**. Some farms have certain basic characteristics that create extra work. This includes: labour-intensive elements of the production system, notably indoor lambing (practised by 6 of the 12 stretched interviewees); labour diseconomies of scope that can occur in mixed farming systems; and characteristics of the farm's location, including farms with multiple sites or non-contiguous land parcels, having land bisected by public footpaths or main roads (which creates difficulties with sheep worrying and moving livestock, respectively), straddling the Wales–England border (which creates administrative difficulties), or being located in hilly areas with long cold winters. Being located in a high-risk TB zone is another risk factor. For tenant farmers, landlords can add additional pressure by removing land [Respondent 52], imposing restrictions [524, 376], not supporting the business plan [404] or not allowing share farming as an option [83].

Having more than one farming enterprise was more common among stretched respondents. Ten of the 23 interviewees who had at least two enterprises were stretched (43%); whereas only two of 11 interviewees with a single farm enterprise (i.e. either sheep, beef or dairy) were stretched (18%), and they were both dairy farmers. All of the stretched interviewees had cattle, but since almost all (31) of the 34 interviewees had cattle, the numbers are probably too small to conclude that a mixed farm with sheep rather than cattle could not also become stretched.

The second group of risk factors could be called **additional elements**. Most of the farms whose interviewees seemed stretched were involved in something that added complexity to the basic farm operation. Such additional elements sometimes generated income, but evidently they also generate extra work or stress. They include voluntary additional elements that someone in the farm entered into willingly, such as diversification, direct selling or adoption of regenerative grazing practices. Eight of the 12 stretched interviewees (67%) had a diversification and/or direct selling enterprise, compared with only nine of the 22 other interviewees (41%). This group also includes involuntary additional elements, often accompanying those voluntary ventures, which covers stressful or time-consuming levels of paperwork and an increase or change in external requirements, particularly concerning animal health and welfare. Nine of the 12 stretched farms (75%) were in a stewardship scheme, versus 10 of the 22 other interviewees (45%). Overall, the average stretched farm was involved in 2.3 requirement schemes, compared with 1.6 for the average relaxed farm and 1.8 for all farms in the questionnaire survey.

Four of the seven interviewees from eco-extensive farms were stretched, compared with only eight of the 27 non-eco-extensive interviewees. This indicates that eco-extensive respondents were more likely than others to show signs of stretchedness and stress during interviews. Eco-extensive farming sometimes involved complex, sophisticated systems such as intensive rotational grazing that created extra work or was difficult to find paid workers for. But mainly, the eco-extensive farmers who seemed stretched were so because they were involved in multiple additional elements, such as direct selling, diversification or a stewardship scheme.

The third group of risk factors are **workforce pressures** which result in a labour-input deficit. These are more difficult to identify since almost any kind of farm can experience them at some point. This particularly applies to the risk factor of illness, injury and death affecting a workforce member. Farms with an older than average core workforce are vulnerable to losing labour-input as ageing farmers slow down or consider retirement, especially if those farms do not have recourse to replacement labour from younger family members or cannot afford paid labour. Not being able to afford as much paid labour as the farmer would like is a critical workforce pressure which is found throughout livestock farming, but is most common on low-income farms with undiversified businesses. Farms that can afford some non-family paid labour are vulnerable to recruitment difficulties, which is a particular risk factor for dairy farms. Half (n=6, 50%) of the stretched interviewees reported in the questionnaire that they had experienced difficulties recruiting workers or contractors, compared with seven (32%) of the other interviewees. One of the stretched farmers (respondent 20) also illustrates that if a farm makes changes to the enterprises in the business, for example by leaving dairy, and paid workers are let go, it can result in labour shortfalls. Another risk factor associated with having an older than average core workforce is that the farmer(s) might have IT literacy issues, although this only affected two stretched interviewees who did not have others to help with this.

A farm need display only a few of these workload and workforce characteristics to become stretched. They combine in different ways on different farms.

10.4 The benefits and costs of connectedness

What is connectedness?

From the questionnaire survey and interviews, it was noticeable that some farms were part of a larger labour and market network than other farms. They were connected to more people in the world of work – family members, workers, customers, advisers and other farmers.

The farms' 'connectedness' derived from three aspects: (1) having a diverse farm business, including farming and non-farming enterprises; (2) having a large workforce made up of diverse labour sources; and/or (3) participating in several requirement schemes and/or marketing channels.

The farms with multiple enterprises and 'additional elements' tended to have more points of social and professional connection, and larger workforces overall. This was illustrated by Figure 7.12 in Chapter 7, which shows how farms with diversified enterprises tended to have larger and more diverse workforces than less multi-faceted farms. Correlation analysis found that the inter-relationships between the three groups of variables that indicate connectedness were often statistically significant (see Appendix 14).

Benefits of connectedness

Having a network of labour and business contacts helps farms to manage their workloads and avoid becoming over-stretched. As we have seen, being able to access labour-input from a deep pool of human capital provides numerical flexibility, access to specialist help (especially on the administrative side) and help in emergencies. Reserves of social and human capital have been found to facilitate adaptive change (Wilson, 2008; Shadbolt et al., 2017; Padel et al., 2018; Kuhmonen, 2020).

The interviews suggest that sourcing labour-input from multiple labour sources is useful because different types of worker offer different things. For instance, family members offer high levels of personal flexibility and might work for free. Having access to flexible family labour helps farmers to manage both peaky and routine work, and can also help with administrative work, especially for farmers who are not IT-literate. Employing part-time or seasonal staff and contractors provides functional and numerical flexibility while also the possibility of labour specialisation. Employing permanent staff allowed some farmers to delegate tasks and work shorter hours. Meanwhile, connections to other farmers as well as professional experts (e.g. accountant, adviser, vet, neighbour) was crucial for helping many respondents to cope with emergencies, meet their administrative requirements and evolve their animal husbandry.

Some mixed or multi-enterprise farms sourced this additional or surplus labour from another enterprise. Having a diversified farm business offers the potential functional flexibility of being able to reallocate labour from one enterprise to another. It can help to smooth out the peakiness of total labour demand over the year, although not if one of the diverse enterprises is highly seasonal. If we think of functional flexibility as a kind of labour economy of scope, sometimes diversification appeared to also offer the farm financial economies of scope (Arai & Morimoto, 2016). The findings add to arguments in the literature that diversification contributes to farm resilience (see Chapter 2.4.3).

Costs of connectedness

Despite the advantages that a large and diverse workforce can bring, respondents from highly connected farms were among those who showed signs of strain. Some of the characteristics that make a farm connected also make it more susceptible to labour pressures because the additional elements create work (e.g. large operations, labour-intensive production systems such as dairying, or workloads from participating in multiple requirement schemes). Large workforces are vulnerable to recruitment difficulties, and members of the core unit might need to spend time away from farming on recruitment, supervision and staff management. Paid workers come and go, which can disrupt the business. The connected farm might generate more capital – financial capital, social capital, personal capital – than a less connected farm, but it might also experience more pressures and face higher fixed or variable labour costs. Accessing labour externally can be challenging, but even when labour is sourced or reallocated from within a diversified farm workforce, we have seen that diversification can lead to diseconomies of scope, go against specialisation and add involuntary additional elements.

Conversely, some of the self-sufficient respondents with a single farming enterprise, a simple route to market and/or a small workforce had a manageable workload, with few labour pressures. Their lack of connectedness was not a hindrance. The interviews suggest such farms' labour systems only become stretched when the farms are forced to be self-sufficient because of unavailability of family labour, unaffordability of paid labour and so on.

Overall, it seems that the most important form of connectedness is having access to a modest amount of family or non-family labour to help at peak times and relieve routine labour pressure. Some interviewees mentioned how important it was to have enough people for routine tasks which need a second or third pair of hands, such as gathering and moving livestock or hanging a farm gate. The extra help is most likely to be provided by a spouse or family member but, if not available, the farm can still retain basic resilience if it can source the labour from an alternative source such as a student or, if it can afford it, a paid worker. For example, Respondent 124 said his mixed beef and sheep business could not afford to support a full-time paid worker, but he had a son who helped part time during the week and when on annual leave at lambing time. Conversely, Respondent 83's children did not want to work on the farm and he was beginning to worry about farm succession, but in the meantime he was able to manage the workload of his mixed beef, sheep and arable farm because he could afford to employ an apprentice and a handyman. Pressure builds when the farm does not have family members available but also cannot source non-family labour, either because they cannot afford to or because of recruitment difficulties.

Since a farm's points of connection and its networks change over time, this aspect of resilience and vulnerability changes too. Sutherland et al. (2012) observe that when a farm undergoes a major change, it often requires the farmers to develop new social and professional networks. A major change can also result in the loss or shrinking of a network. For example, leaving dairy means the farm might lose some paid staff and lose connection with actors in the dairy supply chain and other dairy farmers. Even without major changes, farm workforces expand and contract over time, either because of minor adjustments to the production system (e.g. need to use more contractors for certain tasks, need to use more or less temporary labour at lambing time) or because of dynamics within the workforce itself (e.g. a worker left or retired, a student went back to college, a family member came home and joined the business, a family partnership broke up).

Relative FTE

One further aspect of the farm workforce was considered as a possible risk factor for stretchedness. It is linked to having a large and connected workforce, and is termed here *relative FTE*.

A very coarse attempt was made to compare each farm's estimated FTE with the survey average, allowing for farm type and farm size (explained in Appendix 4). For example, the FTE of a respondent's 200ha dairy farm was compared with the FTE of other similarly sized dairy farms in the survey dataset. Each farm's relative FTE was then classified as Low, Similar or High. Relative FTE is an imprecise measure given that (a) the FTE coefficients themselves are an estimate; and (b) there are many aspects of a farm business aside from its type and size that affect its labour intensity. Nevertheless it was an interesting exercise to see how it relates to stretchedness.

The results (see Appendix 4) showed that the 'relaxed' farms were more likely than others to have a high relative FTE; that is, a larger workforce in available labour-input than other farms of a similar size and type. Conversely, the 12 stretched farms were more likely than others to have a low relative FTE than their peers'. This applied in particular to the group of stretched respondents with low connectedness, who are referred to as stretched type 2 below.

The methodology of this exercise would need to be much improved, but it could suggest that if the capacity of a farm's internal workforce could be accurately measured – perhaps with some weighting added to account for the age of the core workforce members – and compared with an estimate of the farm's SLR, it would be possible to identify farms of a certain type that are vulnerable to becoming stretched on the basis of having a low relative FTE.

10.5 A possible typology

The interviews indicate two main types of farm whose labour system becomes stretched. The first are medium or large farms with large workforces which have multiple sources of paperwork and labour-intensive production systems, often because they are diversified and/or have dairy enterprises. The second are small or medium sized livestock grazing farms, perhaps with some arable or fodder crops, which face fewer external pressures on the workload but are vulnerable to a deficit of labour for financial or family succession reasons. The farms in these two scenarios sit at different points of the connectedness spectrum but share some of the risk factors that place strain on a workforce. They operate at different scales and levels of business complexity, but they share a fundamental problem: an imbalance between the workload and the workforce.

10.5.1 Stretched type 1: Highly connected farms with additional elements

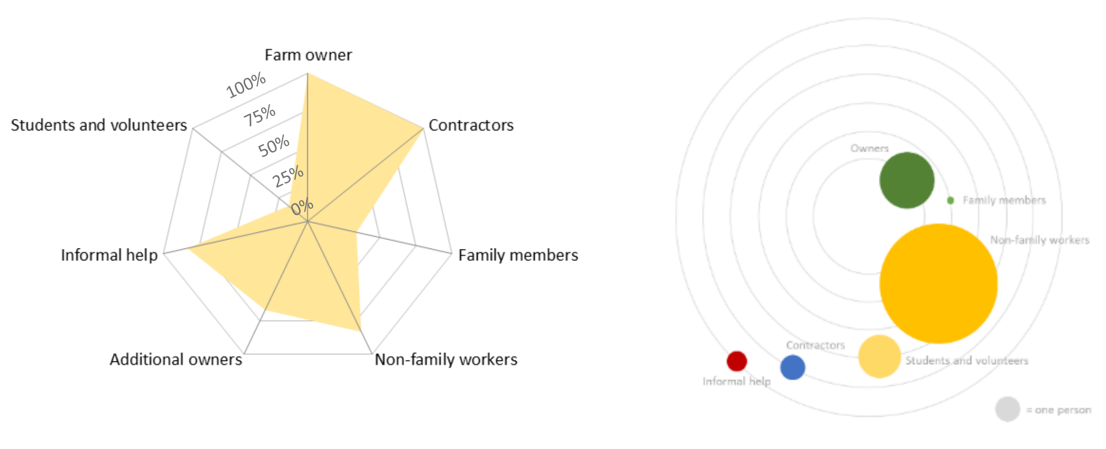


Figure 10.3. Workforce characteristics of stretched type 1 farms (*n*=6)
Data source: survey dataset

Spider diagram on the left shows percentage of farms with each type of worker.
Orbit diagram on the right shows the average number of each type of worker in the farm workforce.

The sample of 34 interviewees is small but the findings suggest that highly connected farms with additional elements are prone to becoming stretched. This describes six stretched interviewees from dairy and mixed farms. Their farms not only had larger workforces than the LFA and lowland farms, they tended to be participating in more requirement schemes and were more likely to be involved in diversification or direct selling. The additional elements generated income as well as workload, but either the farms had not increased the workforce accordingly or they had difficulties recruiting staff. Interestingly, the six farms of this type had very few family members, other than business owners, in their workforces. Five of them reported informal help from other farmers.

It is notable that having a diversification enterprise, direct selling and participation in a stewardship scheme were not the top sources of paperwork nominated by survey respondents nor highlighted in interviews as particularly stressful or time-consuming, but for these few interviewees, they had added to the workload and added to the strain on the workforce.

These farms with complex operations and larger than average workforces could be destabilised by unexpected events: on the workforce side, difficulties finding diversification staff or relief milkers, for instance; on the workload side, Arla's new rule on rearing male dairy calves, or a TB breakdown. To illustrate this, compare two dairy farmers who were interviewed (Respondents 200 and 181). Both were organic, both had started selling milk direct through vending machines, both had similar herd sizes and hectarage, and both used a combination of family and non-family labour. Respondent 200 was assessed as somewhat stretched, whereas Respondent 181 was not. What was the difference? Respondent 200 had difficulties with a stewardship scheme which had added to her administrative workload. One of her workers had gone off long-term sick, and their direct sales enterprise seemed to be more labour-intensive than Respondent 181's system. Respondent 181 did not mention comparable destabilising events and also seemed less assiduous than Respondent 200 – he was prepared to postpone some jobs and did not do everything in his herd health plan. These small things made the difference. Another factor could be that Respondent 200 did most of the administrative work on the farm, whereas Respondent 181 did not (most of the admin was done by his father). It could be that Respondent 200 felt more stressed than Respondent 181 because she was spending proportionally more time than him on stressful paperwork. In the triangle figure 10.7 below, note the positions of 181 and 200 relative to farmwork and administrative work.

10.5.2 Stretched type 2: Farms with few additional elements and insufficient core workforces

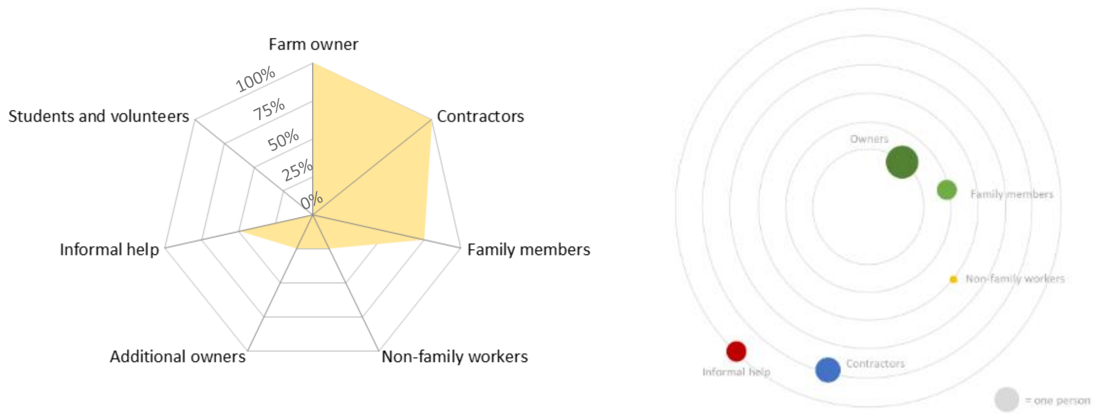


Figure 10.4. Workforce characteristics of stretched type 2 farms (*n*=4)
Data source: survey dataset

Spider diagram on the left shows percentage of farms with each type of worker.
Orbit diagram on the right shows the average number of each type of worker in the farm workforce.

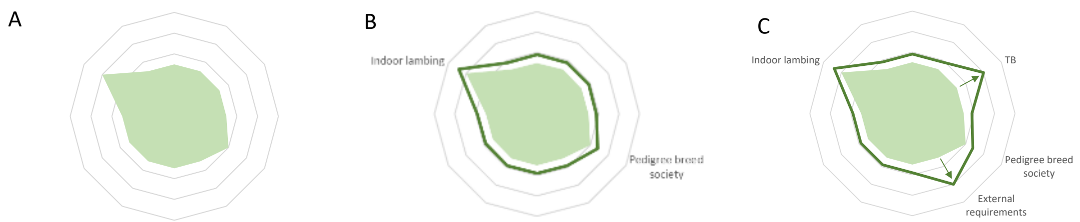
Farms with few additional elements, especially the LFA farms and some of the lowland farms or mixed livestock and arable farms, were less likely to be stretched in the main. Their farmers had developed their systems to suit the small amount of labour available. Many had no option but to work long hours when needed, but as this was more often farmwork rather than paperwork they tended to enjoy it or justify it as part of farming. Some of the farmers might be stressed on the administrative side, for example, by paperwork requirements of a pedigree society or by finding it difficult to use computers, but generally they got help from other people.

However, these farms are vulnerable to becoming stretched as the workforce ages if there is not a younger generation of family members to help out or join the business, because those farms often cannot afford to hire wage labour. This was the case for two of the stretched lowland farmers, one of the stretched mixed farmers and the only stretched LFA farmer. On average, these four stretched farms had an average core workforce of only 2 people, with an average core workforce FTE of 1.6. These figures are much lower than the survey average (3.8 people and 3.2 FTE). Having a small core workforce below 3 FTE could be a major contributor to a farm becoming stretched. This type of farm is also likely to have a low relative FTE. We observe again how vulnerable to labour pressures livestock farms can be when they strip back their workforce and cannot afford paid help beyond seasonal contractors. If the farm then had some additional elements, such as participation in a stewardship scheme, direct livestock sales or coming under external pressure to do more on disease prevention, then the extra work involved could add strain to the limited farm labour system. As with Type 1, these respondents were more likely than the other interviewees to have had informal help from other farms in the past year, which could be an indicator of a labour shortfall.

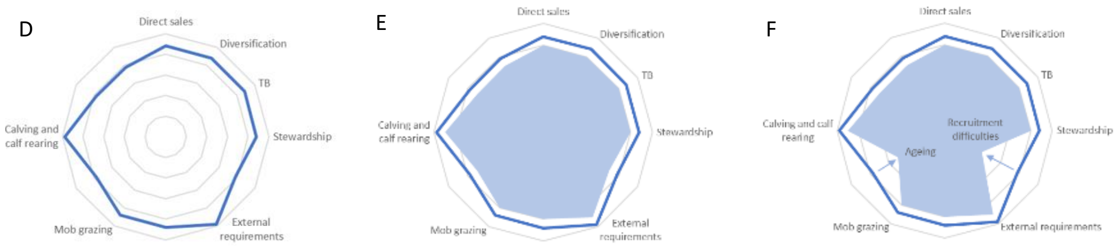
Box 5 attempts to illustrate how the workload–workforce imbalance can affect farms of varying scale and complexity.

Box 5. Workload–workforce imbalance at different scales

Many LFA and lowland farms have a small workforce [A], but that can be fine if it is appropriate for the workload of the farm business, which may not have many additional elements or sources of labour pressure. In this example, the main pressures on the workload are indoor lambing and administrative requirements of a pedigree breed society [B]. Farm labour systems become stretched when something happens to decrease the workforce quantitatively or qualitatively or to increase or change the workload so that the workforce cannot manage it so easily [C]. LFA and lowland farms often cannot afford to hire paid labour, so their main option when workloads increase or change is to stretch working hours, get help from family members, make adjustments elsewhere or consider a more substantial change such as downsizing or leaving a scheme.



Other farms, such as dairy farms, may have more elements to the farm business and more workload pressures [D]. But the larger workload may be manageable by the larger workforce that such farms typically have [E]. These farms' labour systems also become stretched when something happens to increase the workload further or to reduce the labour available in the workforce in quantitative or qualitative terms [F].



10.5.3 Relaxed farms

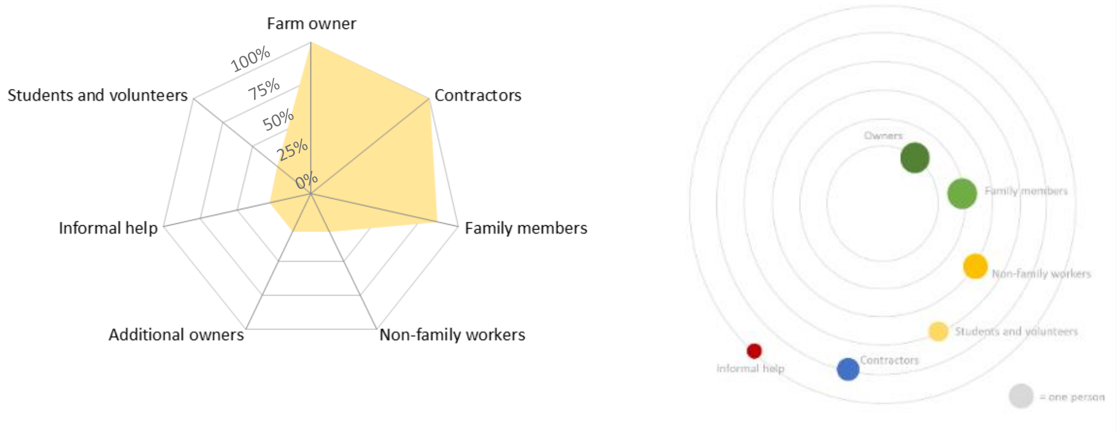


Figure 10.5. Workforce characteristics of relaxed farms (*n*=7)
Data source: survey dataset

Spider diagram on the left shows percentage of farms with each type of worker.
Orbit diagram on the right shows the average number of each type of worker in the farm workforce.

The respondents who were relaxed lacked many of the risk factors that the stretched farms had. They might have had some of the risk factors, but not many. For example, one respondent was in a stewardship scheme, but was not in any other scheme, not even Red Tractor. Another was in Red Tractor and a member of pedigree society, but he was organised and computer-literate so the administrative requirements did not cause him much stress, and he had a labour-extensive beef enterprise with only one route to market. The seven relaxed farms had an average core workforce of 2.8 people (2.1 FTE), which like the type 2 stretched farms is quite small. However, only one of them had a low relative FTE. Indeed, three of the seven had a high relative FTE, meaning their workforce was larger than other farms of similar type and size, which might even suggest a labour surplus. Compared with the type 2 farms, their workforces seemed more in balance with the workload. Most of the seven relaxed respondents farmed small, single enterprise operations with low labour demands. They included two farms that avoided the high labour demands of lambing or calving by buying stores for finishing. An exception is Respondent 432, who lambed hundreds of ewes each year, but he was not stressed because the value of his Cost of Production contract allowed him to hire plenty of paid labour to manage his workload. Two of the relaxed respondents had recently downsized their suckler herds, demonstrating the effectiveness of downsizing as a strategy to relieve pressure on farm labour systems. Only two of the relaxed respondents used informal help in the previous 12 months, which was fewer than the stretched and other interviewees.

10.6 How farmers spend their time

In the questionnaire, respondents were asked to draw a dot in a triangle to show where they personally balanced their time between farmwork, administrative tasks, and marketing and farm business management. To convert their physical pen marks into data, a 1x15 square grid was laid over the triangle and each dot was converted to a pair of *x* and *y* coordinates, according to the dot's position on the grid. This method was inspired by Carolan's (2020) heat map technique.

Figure 10.6 shows the results. The more people marked a spot on the grid, the darker the red. Overall, the respondents felt they spent most of their time doing farmwork – towards the top of the triangle – with some time on administrative tasks and a little less time on marketing and farm business management. (Further results are presented in Appendix 15.)

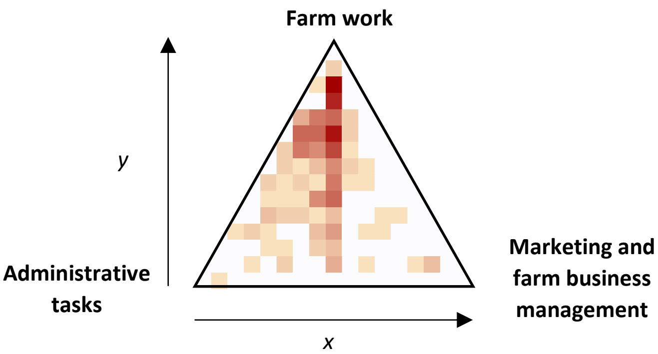


Figure 10.6. How farmers balance their time: all survey respondents who drew a dot (*n*=202)
Data source: survey dataset

The data show an association between the *y* coordinate and stretchedness, where the respondents who showed signs of stress or being over-stretched tended to put themselves lower down on the *y* axis while the relaxed respondents typically put themselves higher (see Table 10.1 and Figure 10.7). Therefore, a relatively good indicator of a respondent feeling stretched is when they spend a large proportion of their time away from farmwork, on administrative or management tasks, as indicated by a low *y* coordinate.

Table 10.1. Association between *y* coordinate and stretchedness
Data source: survey dataset

Respondents	Average *y* coordinate
Stretched	8.3
In between	9.5
Relaxed	10.5
All interview respondents (*n*=34)	9.2
All survey respondents (*n*=202)	8.6

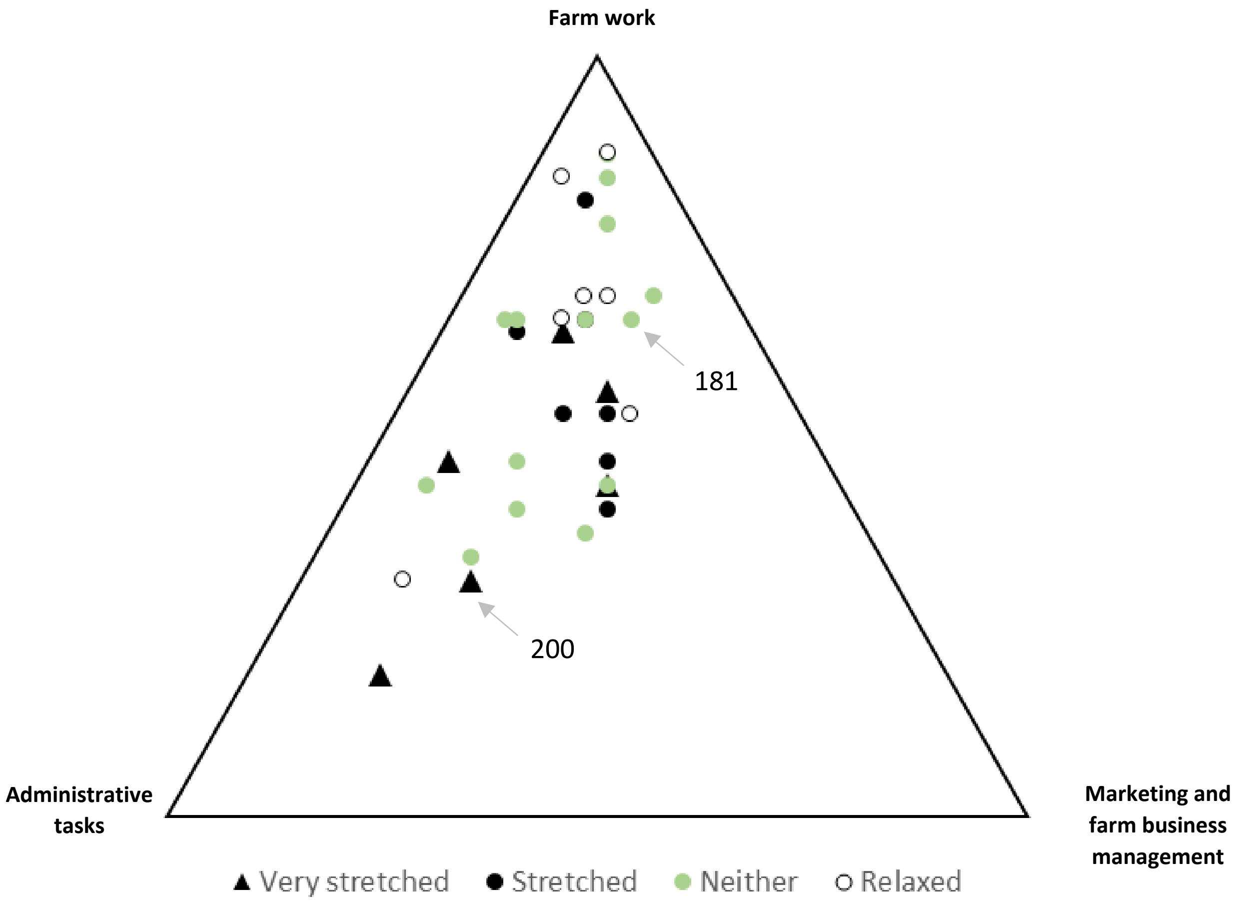


Figure 10.7. How interview respondents balance their time, by degree of assessed stretchedness (*n*=34). The location of the marks made by respondents 181 and 200 are indicated
Data source: survey dataset

10.7 Conclusions for requirement schemes

10.7.1 The effects of external requirements

One of the starting hypotheses for this study is that the work involved in complying with external requirements could stretch the adaptive limits of the farm labour system and force a change to occur. In this section, it is argued that external requirements do contribute not just to farm labour systems becoming stretched and reaching breaking point, but also to major and minor changes made under less stressed conditions. However, it is not common for farmers to respond by leaving a requirement scheme. This is partly because the pressures from external requirements are difficult to disentangle from the other elements of a farm workload, partly because some other pressures are greater, and partly because farmers are often torn about staying in external schemes, reflecting their unempowered positions in food supply chains.

One set of requirements in particular – the statutory requirement for farmers to undertake TB testing and to quarantine and slaughter affected cattle – has led to major changes in farm businesses, particularly the downsizing or sale of beef and dairy enterprises and major efforts to re-build herds. It was sometimes only the anticipation of TB-related problems, rather than actual experience, that led farmers to make a change. But these changes were not triggered by a breaking point in the farms' labour systems; more by the financial and emotional impacts of TB breakdown.

External requirements, including TB-related requirements, do add strain to farm labour systems, but probably in a gradual and cumulative process in combination with other stressors. Throughout this study, evidence has been presented for the ways in which external requirements add to operational and administrative workloads on the farm. It has also been shown that, particularly for respondents who participated in multiple requirement schemes or who were not very IT-literate or scientifically minded

This can contribute to strain on the farm labour system. In one of the breaking point cases and three of the 'stretched' cases summarised above, paperwork and compliance requirements had contributed to the over-load. The sources varied from Stewardship and Basic Payment to private-sector schemes and pedigree breed societies.

10.7.2 Responding to external pressures

Farmers try to prevent reaching breaking point through absorption and adaptation and generally trying to "keep on top of things". The main adaptive mechanisms that the study respondents used to cope with the pressures of external requirements include relying on family members, vets or accountants to help with paperwork and gathering livestock for blood tests; stretching working hours; arranging for TB tests, other disease blood tests and/or health planning to take place on the same day; and either not complying with some of the requirements or postponing other tasks. Dairy farmers are typically subject to greater pressures from external requirements than beef and sheep farmers, but are also likely to have greater capacity to absorb and adapt to them, since many already have a compliance infrastructure (Spence & Bourlakis, 2009) in place and a larger workforce to tap.

There is a gendered dimension in that on some farms, the burden of paperwork and some of the animal health and welfare requirements seems to fall disproportionately on women. If they do not have as much influence on farm business decisions as the men in the workforce (Gasson & Winter, 1992), women might continue to shoulder the burden, and the labour system may thus remain under strain. An example is provided by Respondent 235, from a family-run LFA farm in Shropshire. She did all of the paperwork, including the livestock movement records and the medical record-keeping for Red Tractor, and was heavily involved in the increasingly time-intensive calving and rearing work. The family appeared to be reaching a turning point where they were considering reducing the number of suckler cows and buying youngstock instead to reduce the workload.

> Respondent 235: "We're waiting to reach a critical point. One day we will wake up and decide."
>
> Researcher: "Perhaps your sons are waiting for you to say you won't do it any more [the calving and rearing work]."
>
> Respondent 235: "Yes, you've hit the nail on the head there."

Nevertheless, farmers do sometimes reach breaking point or, even if the workforce is not overly stretched, decide that the situation needs to change. How is this situation resolved? In some cases, the cumulative volume of administrative demands from external sources led interviewees to make a minor change by expanding the farm workforce, for example by hiring a secretary, enlisting the help of an IT-literate family member or leaving an off-farm job. Farmers might invest in business management software or, perhaps, attend computer training. Sometimes the pressure that leads farms to expand the workforce comes from operational, not administrative, requirements. Hence the example of the dairy farmer (Respondent 210) who increased his staffing in response to the requirement from Arla to rear calves to eight weeks. Having access to financial and social capital helps farms to expand the workforce in response to external requirements.

10.7.3 Leaving or staying

An alternative response to the pressure that a requirement scheme adds to the farm labour system is to leave the scheme. This appears to be a relatively uncommon strategy, which could either have little effect other than lightening the workload or lead to a major change in the farm's farming practices and route to market.

According to the interviews, as the cost of compliance with a scheme is perceived to increase, it changes the farmer's cost–benefit calculations of scheme participation. That is, some farmers begin to feel that the time and annoyance of a scheme make it no longer worth the benefits of participating.

Stewardship and Red Tractor

The main schemes about which respondents expressed doubts in this way were Red Tractor and Countryside Stewardship. Since Stewardship agreements last for several years, it would be unlikely for farmers to leave early, although some of the respondents thought that the perceived workload costs could discourage farmers from applying or re-applying. During the scoping discussions, a farm manager revealed that he used to be in an Entry-Level Stewardship scheme but came out of it as soon as he could; he found it too bureaucratic with all the paperwork and did not like the inflexible rules. He had started the application for a new scheme but "threw it in the bin" from frustration.

Red Tractor, in contrast, involves renewing membership annually, and it would be easier for farmers to decide not to continue. During interviews, two respondents said they were considering leaving the scheme. Respondent 66, a lowland Shropshire farmer who sold store lambs and cattle at auction, said he had started to question the value of Red Tractor assurance: "I don't see any benefit in the Red Tractor… it doesn't seem to make any difference [at market]." Respondent 73, a lowland Herefordshire farm who also sold stores at market, said: "We are seriously wondering if it is worth the hassle… I think it's an absolute nonsense."

Six of the respondents said they did not notice a difference between the prices that farm-assured and non-farm-assured lambs fetched at market. Respondent 124 had dropped out of Red Tractor some years previously after finding it too costly, and said there were several farmers in his part of upland Herefordshire who were not certified. The market for sheep had performed quite well in recent years so he perceived no great incentive to be farm assured, and noticed no difference in prices, although Red Tractor could be advantageous for selling cattle. "Everyone jokes that the sheep all get mixed up on the lorry [after the sale] anyway," said Respondent 52, also from Herefordshire. Not all respondents held this view. Respondent 82, a Herefordshire mixed farmer with some sheep, found that Red Tractor assurance added around £10 to the price of a lamb at market ("depending on how desperate people are for lambs").

AHDB publishes average prices of livestock sold at auction markets in England and Wales, and for finished livestock, a breakdown between farm assured and not farm assured animals is provided. Figures from a four-week period in November–December 2020 were reviewed (see Appendix 13), and they showed that Red Tractor assurance made little or no difference to the price of finished lambs. For cull ewes, farm assurance gave a negligible price advantage of 2% in the Midlands, although it was much higher (12%) in the South West. Farm assurance made a greater difference to the prices of finished cattle (heifers, steers and young bulls). In the same period, prices fetched by farm assured cattle were 6% higher than non-farm assured cattle in the Midlands and 16% higher in the South West. However, for sales of cull cows, farm assurance generated only a small price premium of 1% in the Midlands and 4% in the South West. Thus, just from this four-week period in November–December 2020, it seems that Red Tractor certification has only a small beneficial effect on prices of finished lambs and cull ewes sold at auction, especially in markets in the Midlands region. It is unfortunate that a breakdown of prices of store cattle and lambs was not available.

Wiltshire farmer Respondent 491 suggested that Red Tractor was much more beneficial when it came to selling direct to a processor or abattoir. He noted a difference in cattle prices of £60–80 per head, or £20–30/kg deadweight. So he saw farm assurance as an "investment".

Third-party certification

Compared with Red Tractor, other third-party certification schemes appear to create less pressure on farm labour systems and/or to offer greater perceived benefits (financial or otherwise). This applies to organic certification and the Pasture For Life scheme. Respondents did not express any intention of leaving these schemes, since they were considered less bureaucratic add-ons to Red Tractor, provided a clear market premium or subsidy, and had been entered into entirely voluntarily in line with the principles and priorities of at least one person at the farm. An example of this was provided by Respondent 386. He received an annual invoice from the Soil Association of around £700, which included the cost of joint Red Tractor inspection and assurance. He sold finished store cattle to an organic marketing cooperative at around £200/head, whereas it would be around £150/head for conventional cattle, giving him a price premium of at least 20%. For Respondent 386, this easily paid for the financial and labour cost of compliance with organic standards.

According to a farm business consultant interviewed during the scoping stage, a perceived labour or time burden also rarely causes farmers to leave the LEAF assurance scheme – he believed that drop-out typically occurred when a farm stopped selling to the buyer that had required the produce to be LEAF-certified. Similarly, membership of a pedigree breed society could add to a farm's workload in several ways but since it offered financial benefits and gave a sense of pride and enjoyment to farmers, there was no suggestion by any respondent that they might quit.

Buyer schemes and market power

Buyer schemes seem to place a heavier burden on a farm's workload, especially dairy schemes and Cost of Production schemes. Farmers could decide to relieve the pressure by leaving the scheme, but this would be an extremely difficult decision because of the financial implications of losing a supply contract. One dairy farmer in the survey wrote that they lost a premium milk contract because they were not prepared to comply with the increasing number of requirements from their processor. More often, however, farmers appear to stay within the scheme and take measures to absorb the additional demands, albeit sometimes resentfully.

This reflects the unfavourable position that many farmers occupy in supply chains (Toschi Maciel & Bock, 2013; Brooks et al., 2017). It also reflects the ambiguity that exists over the cost of sustainable and ethical farming practices and who should pay for them. How much time does it take to farm sustainably and ethically, and to be deemed compliant – has this been calculated? What is the financial cost of that time? How should that cost be internalised or externalised by the market? This is an ambiguity that downstream market actors may be content to perpetuate.

Respondent 210 supplied milk to Arla, which had added new requirements for producers such as the rule on rearing male calves. The supply contract was financially lucrative for Respondent 210 if he met all of Arla's criteria. "Arla know that we don't really have a choice," he said. "We just have to suck it up." Fellow dairy farmer 213 explained that losing even a penny a litre in his contract would cost the business £25,000 a year:

> "I would be lying if I didn't say that we are always under pressure from our buyer to meet certain standards. We aren't willing to take the risk [of not complying]."

By offering lucrative contracts to a small pool of producers, the processors and supermarkets can add requirements and wait to see which of their suppliers will stretch to comply with them and which will leave. Respondent 432 is an example of a supplier who had decided to stay in a Cost of Production contract with a supermarket. The extra administrative demands of the contract felt manageable to him, but he knew some farmers who had left.

> "I know of other farmers paying someone £600 a year to crunch the numbers for [supermarket]… Farmers [who remain] in the scheme don't whinge because the prices are good. But the bar's getting higher and the carrot is getting smaller."

The manager of a dairy enterprise commented during a scoping visit that "it would be economic suicide" to leave their supermarket Cost of Production contract. In livestock and dairy farming, the terms of trade are so poor and farmers are such price-takers that it seems farmers will absorb considerable demands on their time and that of their workforce in return for some price and market stability.

Even with Red Tractor, the financial stakes can be high. Some respondents said they were conscious of the market influence of Red Tractor and the buyers who require it. In his work *Weapons of the Weak,* Scott (1985) described how exploited groups resist those in power through forms of quiet, disguised rebellion that he called everyday resistance. Arguably, some of the livestock farmers in this study were asserting everyday resistance against scheme inspectors and, by extension, powerful market actors, by leaving paperwork to the last minute or not complying with all of the requirements. However, they reported no overt signs of refusal to comply. In the words of Respondent 175, "you have to play their game". Respondent 83 said he was very aware of the power that Red Tractor had to remove his assured status, which he needed to sell grain. Similarly, Respondent 200 said, "We have to be Red Tractor certified… all dairy farmers need it to sell milk." The farmers who sold through livestock auctions were more free to question its worth but they, too, might feel a pressure to be farm assured, especially if they felt it would help with prices and exports after Brexit. Respondent 124 said that at one point, it was implied that a farmer would not be able to sell at auction without being farm assured, although he had experienced no difficulties since leaving Red Tractor.

Several respondents had mixed feelings about Red Tractor – they were frustrated with the paperwork and inspection requirements, perhaps, or some of the rules that they perceived to be trivial, but also felt that it was important for holding livestock farmers to account, and some did think that aspects of Red Tractor benefited their business, especially around animal health and welfare.

Farmers might enter a period of reflection where they weighed up the perceived costs and benefits, the tensions between market pressures and workload pressures, of Red Tractor and other schemes. For example:

> Respondent 52: "My partner often says, what is the point of it [Red Tractor]? But I'm hoping there will come a time when it is worth it."

> Respondent 95: "I'm not convinced that Red Tractor is worth it. I have sometimes said we won't bother."
>
> Researcher: "I was wondering, with the loss of Basic Payment, if some farms will drop Red Tractor because they will need to cut costs, or will some actually stay with Red Tractor because they need to make as much money as they can at the sales?"
>
> Respondent 95: "That's a difficult one to answer. On the one hand, we've got to maintain standards to sell lambs to the EU, but on the other hand, is it worth while? I'm going to stay with it for the moment and see what happens."

While they were in this holding pattern, farm labour systems could come under strain as they responded to the scheme's growing operational and administrative demands. Farmers could remain for a long time in a situation where they are stressed and/or stretched by the demands of an external requirement scheme but do not take decisive action. Using Sutherland et al.'s triggering change model, these farmers could be said to be at the stage of "accumulation of experiences which results in the recognition by the farm manager that a major change in farming activities needs to occur". But it is not sure that such situations will always lead to a breaking point or otherwise trigger a change. Farmers might decide to remain in the scheme and either tolerate a level of stretch in their workforce or make adjustments to reconfigure the workload and relieve some of the pressure. A change in the terms of trade – better prices at market, for example, or a more remunerative contract – might even shift the cost:benefit ratio or allow the farm to recruit more labour to meet requirements.

11. Looking to the future

The questionnaire survey and interviews, as well as insights from the literature, the FBS and the analysis of requirement schemes, shine some light on how labour needs and employment patterns have been changing on livestock farms in the UK. They show how external policies, requirements and recommendations are shaping the nature of work and the kinds of human resources – people, skills – that are required. This chapter considers how things might progress in future as livestock farmers continue to respond to external pressures and chart their own strategies for business development and survival. Two policy case studies are used for exploring these ideas in more detail under two particular scenarios. The aim is to draw some conclusions for Research Question 4, 'Which farmers are best or worst equipped to meet the changing nature of work and emerging labour needs in livestock farming?'.

11.1 How farmwork and labour needs are changing

The following trends are observed:

- There is growing demand for **IT literacy** among farmers. This is due to the increasingly digital nature of administrative work, with VAT returns needing to be submitted online, web portals for submitting information and remote farm inspections. Farmers are being advised or requested to conduct more data collection and monitoring, and are likely to be asked to make more use of EID data in future, especially if and when compulsory bovine EID ear tags are introduced.[19]

- Following the end of the Basic Payment and the introduction of ELM, there may also be demand for greater **'eco-literacy'**, so that farmers are able to speak the language of ecosystem services, carbon sequestration and biodiversity, and navigate government systems for applying to AES. Just as some farmers rely on accountants to help with online accounts and vets to advise on disease management, there may be more demand for agri-environmental advice in future.

- Despite the external push for digitalisation, there remains a strong need for **paper-based alternatives** for farmers who are not particularly IT-literate and/or have slow internet connections. This applies to a great many farmers in Herefordshire, Shropshire and Wiltshire. As observed by respondents 95 and 243, two LFA farmers, it is not only older farmers of retirement age who do not use technology; it can also be younger farmers in

[19] The government is developing an online system to replace paper cattle passports and holding registers. Called the Livestock Information Service, this would amalgamate BCMS with ARAMS. Although the documentation on LIS states that farmers will be able to continue to use paper systems if they prefer, it is clear that the intention is to have a paperless system which will create possibilities for data analysis (AHDB, 2019b; NFU, 2020a).

their 50s, 40s or even 30s who are not comfortable with IT because they were not brought up on it.

- There are some signs that livestock farmers are being asked to take a **more scientific approach** to farming, whether in controlling disease or managing grassland. This is not always compatible with farmers' preferred approaches or their limited labour capacity.
- Though many farmers struggle with these trends, they have been helped by increasing numbers of **family members** returning to the farm with a university education and having grown up with computers. Also, farmers' wives and other family members with part-time jobs are bringing outside experience, including with computers, to the farm business.
- The introduction of statutory controls for bovine TB has had far-reaching consequences affecting farm labour systems, especially the demands for testing and biosecurity and the impacts on farm workforces when herds are lost or rebuilt. Trends in livestock health testing are requiring farmers to **move and handle livestock frequently**, and this might increase in future if climate change forces livestock to be moved to fresh pasture more often, or farmers are incentivised to adopt intensive rotational grazing regimes such as mob grazing or integrate livestock grazing into arable systems (Short & Dwyer, 2012; Alison Millward Associates, 2014; Peyraud, Taboada & Delaby, 2014). This will probably increase the demand for labour-saving equipment and infrastructure. Time and money for shelter belts and manmade shelters may also be needed.
- More sheep enterprises may shift to **outdoor lambing** if their breeds and local weather conditions allow. This was reported by respondents and has also been observed anecdotally by two stakeholders consulted (anonymous researcher and National Sheep Association officer, personal communication, 2 and 11 June 2021). This could make labour demands less peaky and ease some of the pressure on sheep farmers with small labour capacity. Conversely, the trends towards **tighter calving blocks and closer surveillance of calves** may continue, making this aspect of livestock farming more peaky and potentially increasing demand for flexible labour at those times. As requirements concerning male calves become widespread in the dairy sector, many dairy farms must commit more labour to **rearing young animals** and developing sales channels for them.
- Many respondents perceive the workload from external requirements to have increased in recent years, yet farmers need to **do more with less**. In 2018/19, the only livestock sector where the average farm did not make a loss from agriculture was dairy farming. It is likely that many farms cannot afford to employ sufficient labour to meet their workloads

without some over-work. Some lack a second or third pair of hands at key times. It was not a topic for this study, but there are concerns that lone working and long hours may be contributing to a rising rate of accidents and deaths in UK agriculture rate (Worsfold, 2018; Cutress, 2021; Tasker, 2021).

- Some farmers are challenging the culture of overwork and trying to set limits on their time for a better **work–life balance** and family life. This forces them to make systems more efficient and may lead them to use additional labour. A dairy respondent discussed how managing workers' hours helps with staff retention, and this has become an increasing concern since **labour scarcity** is a growing problem for dairy farms in particular.
- In general, there is continued need for **flexible labour** – contractors, relief milkers, seasonal workers, veterinary students and family members. Farms value people who can work occasionally or part time but increase their hours at peak times.
- But demand for **specialised skilled labour** is likely to only grow, which can be difficult to combine with the need for flexible workers, as some dairy farms using agency or relief milkers have found. Members of the core farm workforce in particular, but also those who work on the farm business on a temporary or irregular basis, need to practise increasingly high levels of livestock husbandry and health management; to develop advanced knowledge of grassland management and grazing systems; and to have online skills and business skills for non-farm diversification and direct selling.
- There has been a professionalisation of informal farmer help **networks**. Where farmers used to help each other out, they are often now in client–contractor relationships, albeit still friendly or neighbourly. Informal help between farmers often now takes the form of knowledge exchange. Some farmers participate in distant or virtual networks, such as dairy benchmarking groups, regenerative agriculture networks or supermarket producer groups.
- **Labour–technology substitution** in agriculture continues. Study respondents have saved on human labour by investing in sorting gates, automatic feeders and scrapers, robotic milkers, ATL systems and management software.
- If they cannot source (or afford) the necessarily skilled but flexible labour, farmers might continue to contract out whole enterprises or to downsize. This might result in more **specialisation** not only at individual worker level but also at farm business level. If fortunate and successful, the farm might intensify and increase its production and expand its workforce. Others are reducing overall their labour demand.

- At the same time, livestock farms have diversified into non-farm enterprises. The study findings suggest that **diversification** can increase the demand for paid labour, often seasonal, but can also put existing workforces under pressure. A small number are doing **direct selling**. This can take some labour away from farmwork and require new skills. In the survey questionnaire, 31 respondents said they were planning a new diversification business and 23 wanted to improve their marketing and sales, both of which they thought might need additional skills and knowledge.
- There has been rising participation in niche **requirement schemes** that might deliver a valuable contract or market advantage such as CHECS livestock health schemes, Pasture For Life or supermarket Cost of Production schemes. In the mainstream, however, Red Tractor remains the baseline although some sheep farmers might be questioning whether it is worth continuing. There is a trade-off between the benefits of scheme participation and the additional workload (often administrative) and inspections required.

The remainder of this chapter explores some of these observations in two case studies. These explore how farmwork and labour needs have been affected in two selected areas of interest to agricultural policymakers in the UK. The first case study considers the labour effects of external requirements for disease monitoring and prevention. The second considers the labour implications of farmers adopting intensive rotational grazing practices, which have to date been farmer-led, but are likely to be promoted by government and private-sector actors in future. The aim of the case studies is to provide a qualitative assessment of farmers' experiences and an analysis of what it might mean if the practices are encouraged more in future agricultural policy and private-sector schemes.

11.2 Policy case study 1: Disease monitoring and prevention

Source: Cee Bee on Flickr, under Creative Commons

11.2.1 Introduction

This case study addresses requirements for UK livestock farmers that concern the prevention or eradication of certain endemic livestock diseases and growing resistance to antibiotics and anthelmintics.

Eight survey respondents were selected for telephone interviews to discuss this topic in depth. They were two dairy farmers who participated in schemes with strict requirements in this area (Arlagarden and OMSCO);[20] a dairy farmer and an LFA farmer who indicated in the questionnaire that they were worried about the labour demands of future requirements; and four others who were selected because they gave mixed comments in the survey on the likely workload effects of disease prevention measures or reducing their use of antibiotics and anthelmintics. Disease prevention was also discussed in the other interviews, when time allowed.

The discussions covered reduction in use of antibiotics, parasite control, actions on livestock disease and general reduction in medication and injections.

11.2.2 Background

Bovine TB, which has featured several times in this study, is a statutory disease, which means that cases must be reported to authorities and the testing and control measures are enforced under legislation (FSA, 2020). This case study concerns efforts to control diseases that are not statutory. The most important non-statutory diseases for cattle are BVD, Johne's disease, leptospirosis, neospora and infectious bovine rhinotracheitis (CHECS, 2019a). Sheep suffer from an ovine variant of Johne's disease, as well as other infectious conditions such as maedi visna (MV) and

[20] Suppliers to the organic milk cooperative OMSCO must comply with the NOP organic scheme.

ovine pulmonary adenocarcinoma, which are collectively known as iceberg diseases since they can exist undetected in animals (AHDB, 2019a; NSA, 2020).

Endemic diseases are under-studied but are thought to affect reproductive success in cattle and sheep (AHDB 2019a). In 2014, the Farm Animal Welfare Council concluded that "current levels of endemic diseases in UK livestock are unacceptable and there is a need to prevent, eradicate and treat them more effectively" (FAWC, 2016).

At the same time, efforts continue to address growing resistance to antibiotics and anthelmintics. The use of antibiotics in UK agriculture has been falling, from an average of 129mg/kg of farm animals in 2014 to 31mg/kg in 2014 (RUMA, 2020). Housing livestock can increase the risk of infections for which antibiotics may be used, and so intensive dairy and beef systems, including calf-rearing, may have a higher reliance on antibiotics and perhaps be more exposed to the problem of antibiotics resistance than extensive outdoor systems (Evans & Border, 2018; RUMA, 2020).

The problem of internal parasites becoming resistant to anthelmintics, or wormers, has become a growing issue for livestock producers around the world (Abbott et al., 2012; Charlier et al., 2015; Kenyon et al., 2017). In 2003, the industry group SCOPS (Sustainable Control of Parasites in Sheep) was established to address resistance to sheep anthelmintics in the UK, which was thought to be especially prevalent on lowland grazing farms (SCOPS, 2012).

11.2.3 Requirements

To date, since these issues are not statutory or notifiable, the UK government has relied heavily on voluntary and industry-led initiatives to address them (RUMA, 2020). Maye et al. (2014) argue that the high costs of disease control have driven successive UK governments to shift the burden on to producers (see also Toschi Maciel & Bock, 2013). Several producer organisations and advisory groups are tackling endemic disease in cattle and sheep. In addition to SCOPS, they include the Cattle Health and Welfare Group, established in 2009, and newer groups such as Project LAMB, which promotes proactive measures for sheep health, Control Of Worms Sustainably (COWS) and Sheeplameness.co.uk. England has the BVDFree scheme, a voluntary programme (Evans & Border, 2018). Guidance is also produced by the main industry bodies such as AHDB.

Some of the disease prevention initiatives have developed accreditation schemes for farmers to certify their animals are disease-free. As discussed in Chapter 5.1.1.6, there are a number of livestock health schemes, many of them regulated by Cattle Health Certification Standards. CHECS was initially used primarily by pedigree breeders as an accreditation tool, but farmers are increasingly using cattle health schemes in response to government and industry disease control initiatives or to cut costs by reducing veterinary fees or improving herd health. In 2019, CHECS announced that membership of its accredited schemes had risen by 30% in two years to cover 13% of all UK cattle farms (CHECS, 2019a; 2019b).

Increasingly, livestock farmers are being required to take measures on disease prevention through rules in farm assurance and certification schemes, as Chapter 5 identified. These requirements tend to affect cattle enterprises, and especially dairy enterprises, more than sheep enterprises. In 2019, Red Tractor updated its dairy standards to include, inter alia, a requirement for farmers to have a Johne's control strategy, signed by an accredited adviser, and a BVD eradication programme designed with a vet (Red Tractor Assurance, 2019a). To assess compliance with such rules, external requirement schemes use health outcome indicators, whereby farmers must record clinical data and incidence of disease (Paton, 2014).

The RSPCA, Soil Association and Pasture For Life schemes all require farmers to minimise their use of antibiotics; Waitrose requires its suppliers to end their use of critically important antibiotics as soon as possible. In 2019, the dairy processor and cooperative First Milk launched First4Milk standards which included a requirement for farmers to reduce antibiotics below Responsible Use of Medicines in Agriculture (RUMA) targets by 2020 (First Milk, 2019), while Arla requires of its milk suppliers that antibiotics are applied only by a vet or skilled employee (Arla Foods, 2017). OMSCO member are prohibited from using any antibiotics, since OMSCO sells milk to the United States, whose organic rules are very strict (USDA, 2021).

The interviews found that pressure on respondents to take measures in this area came mostly from dairy buyers, and pedigree breeding societies and buyers, but farmers also noted pressure from their vets, usually through Red Tractor. Farmers can only obtain antibiotics via a vet, so their role in encouraging less use is critical (RUMA, 2020). Respondents felt obliged to take action because it was required of them by their buyers or Red Tractor, but those who were members of more voluntary schemes such as organic certification or a pedigree breeding society accepted that it was part of the deal. Some, like Respondents 297 and 364, were also motivated to act because of their own concerns over the financial cost of disease to the farm business, but others felt the measures were being imposed upon them with no real benefit.

11.2.4 Effects on workloads and labour needs

Animal husbandry

Because of the need to address antimicrobial and helminth resistance, UK farmers are being encouraged to prevent livestock disease without the preventive use of antibiotics and wormers. Vaccinations are encouraged, as are changes to the husbandry practices and the animals' environment such as strengthening animals' immune systems with colostrum or scraping yards more frequently (Higham 2019; Morley, 2019). In dairying it was previously common to administer antibiotics to all dry cows to prevent mastitis, and successful efforts have been made to gradually replace this practice with selective dry cow therapy (James, 2019; RUMA, 2020). Changes to indoor and field infrastructure can be made to improve biosecurity and prevent infection pathways by cleaning animal housing and passageways more often, applying lime around water troughs or composting manure to kill antibiotic-resistant bacteria (James, 2019; SCOPS, 2019; Sheeplameness.co.uk, n.d.; GOV.UK, 2019b).

During the scoping phase, a dairy consultant remarked that reducing antibiotics required a substantial time commitment from farmers, involving eradicating disease, changing farm infrastructure and investing in skills training. Respondent 245, an LFA farmer from Shropshire, was learning to farm sheep without the "safety measure" of antibiotics and wormers. Like others', his approach was becoming more proactive or perhaps, more reactive, in that he looked for signs of ill health and reacted, giving antibiotics only to those animals that needed them.

Another Shropshire LFA farmer, Respondent 235, said her farm had reduced injections as a result of Red Tractor requirements and was using more homeopathic treatments. The OMSCO dairy farmer (Respondent 181) had stopped using antibiotics, and used Golden Balm, a cream containing essential oils, to treat udders of cows with mastitis. The organic farming sector has long promoted homeopathic alternatives and preventive health planning for its producers, who are more restricted than others in their recourse to medical inputs such as antibiotics (CORE Organic, 2010) (Figure 11.1).

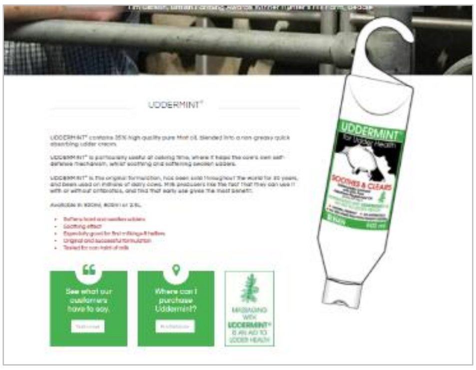


Figure 11.1. Some dairy farmers used non-antibiotic products such as Uddermint for treating mastitis
Source: http://uddermint.com/uddermint/

Monitoring

Many of the disease prevention initiatives emphasise monitoring livestock for signs of ill health (Cattle Health and Welfare Group, 2018; Higham, 2019; Morley, 2019). Monitoring is also a requirement of several of the external requirement schemes such as Pasture For Life, LEAF Marque and Morrison's (see Chapter 5). In Herefordshire, Respondent 53 had been reducing antibiotics, and this meant he and his wife had to spend more time monitoring their sheep and cattle:

> Researcher: "How has [reducing antibiotics] affected your workload?"
>
> Respondent 53: "It probably has created more work. You know, we have to watch the animals more closely."
>
> Researcher: "Is that mostly at calving time?"
>
> Respondent: "Calving, but also weaning time, and during severe weather conditions, when it's very hot or very dry."

Fellow Herefordshire farmer Respondent 20 explained that she and her husband had cut down on medication because of Red Tractor. She thought this was a positive development but noted that it had increased the time and they needed to spend with their livestock – specifically, calves, which now needed to be kept in nursing pens and monitored every four hours.

Testing and analysing data

A related area of disease management that some respondents were doing more of than they used to is testing. This was mentioned by dairy farmers in relation to mastitis, BVD and Johne's management programmes that they were following under instruction from Red Tractor or their milk buyer. They were required to take regular cell counts, blood tests and tissue samples from cattle. For example, dairy farmer 210, an Arla supplier, was required to conduct blood tests once a year for Johne's ("We should probably do it more than once a year, but I don't get round to it"), quarterly screening of bulk milk for BVD and IBR, and cell counts to justify limited application of antibiotics using selective dry-cow tubing. Some lowland livestock farmers were also conducting blood tests for a CHECS scheme or a pedigree breeding society.

Such tests were time-consuming even for farmers like OMSCO supplier Respondent 181, whose workload had not been significantly affected by the withdrawal of antibiotics. Time was needed for gathering the animals and then recording, analysing, reporting and acting on the data. Some farmers were managing the extra workload by scheduling tests for BVD and Johne's at the same time as a TB test or bulk milk test.

In addition, sheep farmers are being encouraged to monitor internal parasites more closely through faecal egg counts (FECs) (Kerr, 2019; SCOPS, 2019). Though it was not discussed in every interview, five respondents said they did FECs. They were all experimental and analytical in their approach to livestock farming. Unlike blood tests for cattle, the work was not described as time-consuming. Four interviewees who were perhaps older and less experimental had not really embraced the idea of FECs, although one, Respondent 53, said he was considering it on his vet's advice.

Working more closely with vet and taking a more scientific approach

The latest requirements in disease management were causing respondents to work with their vets in a new way. Respondents were spending more time (and money) with vets on planning, testing and vaccinations, and less time on remedial call-outs. Vets seemed to be providing more advice, partly through the health plans that farmers are obliged to develop under Red Tractor (Koops, et al., 2018). In the main, the respondents valued their vets' advice, but it could sometimes be a risk to deviate from the established way of doing things. For example, Respondent 53 recalled that he had been advised by his vet to reduce his use of Spectam, an oral antibiotic, but he subsequently lost two lambs to watery mouth disease, so he started using Spectam again.

The voluntary guidance on livestock disease management seems to encourage farmers to work in a more 'scientific', experimental way. For example, farmers are encouraged to weigh their sheep to calculate the exact amount of drench required and thus avoid over-dosing anthelmintics (Charlton & Robinson, 2019), or to carry out FECs with a microscope before deciding if drenches are needed. The recommended monitoring of health indicators is another example of an observational, scientific approach. In the interviews, it appeared that while this way of thinking and working may be natural to trained scientists such as vets, it was not always consistent with the way that farmers work.

In their research, Escobar and Demeritt (2016) observed that farmers were not accustomed to using recorded data to manage animal health, and this was apparent in some of the discussions on BVD and Johne's disease. Respondent 175, a relaxed lowland farmer, said that he had given up on his Johne's programme because testing gave too many false readings. Respondent 364, a dairy farmer, had been ignoring the findings from his BVD monitoring since they showed a negative result with high antibodies, which did not make sense to him. Respondents sometimes lacked the patience to follow a testing, monitoring and management regime if it did not rapidly produce clear findings or outcomes – perhaps missing the scientific ethos of repeated testing even in the face of negative results. There was also a sense that farmers needed extra time to use the findings, and were not always sure how. Fellow dairy farmer Respondent 210 had recorded increased levels of

IBR but had not done anything about it. Sheep farmer Respondent 109 was sticking to his system of things like ear notches over using EID data for keeping track of individual animal information. Technological approaches create more work, he said, and "analysis paralysis".

Segregation

Similar to TB quarantine, best practice for the management of non-statutory disease is to segregate affected animals and, in the case of dairying, their milk. Cattle health expert Rob Smith has noted that owing to financial constraints, many livestock farmers today lack the necessary spare land and sheds for properly quarantining sick animals (Morley, 2019).

The interviews showed that segregation was troublesome for respondents, not so much because of the need for extra space but more because of the time that separating livestock and checking each group requires. For dairy respondent 364, his Johne's disease programme was creating extra work at calving time, because the cows had to be separated into two groups – one with signs of the disease and one without. Conversely, the OMSCO dairy farmer (Respondent 181) said that giving up antibiotics had lightened the workload since there was no longer a risk of milk becoming contaminated and needing to be dealt with. Previously, staff would have needed to mark up cows for segregation: "It was just an extra thing to think about."

Summary

Current guidance and external requirements on livestock disease prevention and the use of antibiotics and anthelmintics call for certain ways of working with consequences for farm workloads and human resource needs. They include:

- Preventive or reactive animal husbandry;
- More time caring for and checking animals;
- More time gathering and segregating animals;
- Collecting and analysing data;
- Working more closely with vet in planning and prevention;
- Working in a more scientific, experimental way.

11.2.5 Who is best equipped?

The interviews give some insights into which farmers' workloads are most affected the most by external requirements on disease management and the use of antibiotics and anthelmintics.

To date, the greatest pressure has been on dairy farmers. They tend to use more antibiotics than beef and sheep farmers (RUMA, 2020), and have also come under more supply-chain pressure to act on endemic conditions such as mastitis, Johne's disease and BVD. However, dairy farmers have an advantage in that they are likely to have already in place an 'infrastructure' of testing and monitoring for milk quality and safety and to be more comfortable in collecting data for their buyers. Other farmers are needing to start from scratch. Some dairy farmers also can do testing and monitoring more easily than beef and sheep farmers because they are in closer contact with their livestock, since cows are milked every day and may spend more time indoors.

Therefore **farmers with extensive grazing systems, and certainly those whose livestock are out-wintered**, face greater challenges in monitoring, gathering and testing animals, but also for preventive activities like foot-bathing. Those who have outdoor handling systems are at an advantage. Relevant here, too, are the **farmers who have sophisticated equipment** linked to EID tags, such as automatic sorting gates, and who track individual health performance with software.

This suggests that **farmers who are not *au fait* with technology and/or who lack broadband internet** can find some aspects of disease management requirements more difficult to comply with. It also implies that farms without the money to invest in precision livestock equipment are at a disadvantage. Meeting external requirements on disease management involves added costs, which might only be rewarded through the market – for example, Respondent 245 said MV accreditation helped him achieve "a tidy profit" on his pedigree Texels. Many respondents were in captive relationships with the party making external requirements, such as Red Tractor or Arla, and felt obliged to carry out the measures without direct compensation. In addition to the optional cost of equipment, software or infrastructural improvements, respondents spent money on veterinary advice, blood tests and FEC analysis.

Many interviewees were not clear if and how improving their disease management would financially benefit their business. Every medical and nutritional input is considered for its cost, benefit and risk, but with so many diseases being subclinical and having an unknown effect on productivity, it was difficult for farmers to weigh the cost of taking measures against the cost of keeping the *status quo*.

Respondent 297, a lowland farmer from Shropshire, had satisfied herself that the benefits outweighed the additional time and cost. She said, "It does take quite a lot of time to be doing these things and you do wonder if it's worth it, but it would be a complete waste of time if you kept an animal for 12 months and then found out it is barren." With this in mind, she and her husband followed multiple disease prevention measures for their suckler cows, including vaccinations and regular monitoring. She also commented on why it is so important for them to use wormers for their sheep:

> "With worms and fluke, lambs can drop dead, or they won't grow as quickly, they will be stunted, so you can't get them away to market so soon. So preventing disease should pay for itself, at least when the prices for store cattle and lambs are good, as they have been this year. If you lose a lamb that would have sold for £90, that's £90 lost, plus the cost of £12 to dispose of the carcase … if you lose say three or four lambs in a season, that is £400, so if you compare the cost of that with the cost of worming, then yes, worming is worth it. Plus, if an animal dies then you have to address the problem by worming the rest of the animals anyway."

Her comments give an indication of why persuading sheep farmers to reduce their use of anthelmintics is proving difficult (Bellet, 2018; RUMA, 2020). Respondent 245 outlined the business risk involved:

> Researcher: "Are you saving money by buying less medicine and drenches?"
>
> Respondent 245: "You can save money, but as long as you get it right!"
>
> Researcher: "What do you mean by that?"
>
> Respondent 245: "If you miss the signs of Nemo [*Nematodirus battus*] on Friday, and can't buy a drench until Monday morning, you could lose a lot of lambs… I think it [reducing wormers] takes experience. It would be difficult for someone just starting out."

Presumably, some farms that are following the guidelines are saving time in drenching fewer sheep, not having to record so many medicine applications, and so on, but this was not mentioned in interviews. Indeed, **labour constraints** do hinder farms from carrying out everything in their health plans. The respondents tended to manage the workload through flexibility and stretch and by asking their vets for help. The workload would not justify in itself hiring additional labour, and it is not typically the kind of work that can be done by contractors, except for perhaps some of the peaky shepherding tasks. Respondent 395, a dairy farmer from Herefordshire, was asked how he was coping with what he was being asked to do on disease control.

> "I'm coping with the workload OK. It's a bit frustrating for my wife; and my father – if he were still alive, he would be pulling his hair out… I do feel the pressure. It's an extra load" (Respondent 395)

Therefore, **farms with low labour capacity** are likely to feel the burden on disease management measures more than others. Other research has documented the effect of labour constraints on livestock health work, such as Bellet's (2018) study on anthelmintics use and the study by

Palczynski et al. (2020) on factors hindering dairy farmers in England from feeding colostrum to newborn calves. The labour constraints are caused by the reasons already elaborated: inaffordability, recruitment difficulties and competition from other labour demands – including other external requirements. Farmers who can access flexible sources of labour for tasks such as gathering cattle for testing or for closer animal work at lambing and calving time, may be at an advantage. Pursuing a strategy of labour specialisation which allows farmers to focus their time on livestock husbandry might also be beneficial. The Farm Animal Welfare Committee have noted that intensification of livestock farming is requiring "higher standards of stockmanship". They use the term "margin for care" to describe the importance of farm businesses making sufficient financial returns to be able to afford the time needed for meeting external recommendations in animal welfare (FAWC, 2016:10).

11.2.6 Implications for the future

The evidence suggests that in future, the demands on farmers will continue to grow as more and more schemes adopt requirements on disease management and the nature of the requirements evolves. The present UK government is developing an Animal Health and Welfare Pathway as part of the post-Brexit agricultural policy reforms. This is likely to involve updated statutory and voluntary requirements on disease prevention, including greater disease monitoring (Jones, 2020). It might also include measures to financially support farmers to conduct disease testing and take biosecurity measures (Defra, 2021). Animal welfare and health are also viewed as public goods to be promoted under the new ELM framework (Defra, 2018a). In its 2020 update on progress on antimicrobial resistance, RUMA suggested that the strategy must shift from ending prophylactic use to a focus on disease prevention and "improving farm management" (RUMA, 2020:2). RUMA's report suggests that collection of farm-level data will only increase, and that beef and sheep farmers are likely to be encouraged to adopt more of the measures already asked of dairy farmers. Proposals included making it a condition for any public support money that farmers submit health data, and for the Red Tractor beef and lamb standards to include a requirement for a member of the farm workforce to undertake training in antibiotics use.

Figure 11.2 suggests that the message on reducing antibiotics had got through to most survey respondents and they were implementing it. In particular, most eco-extensive farmers felt they were already minimising antibiotics to the extent possible. However, the message on reducing anthelmintics was not being acted upon to the same extent. The chart also shows that a large minority of farmers thought that doing more animal monitoring and measuring would increase their workloads, and that fewer of them were doing this already.

A small number of the LFA survey respondents thought that reducing anthelmintics and doing more monitoring and measuring would actually save them time. This may be because they anticipated having to drench fewer sheep, in relation to the anthelmintics; or that it might enable them to improve lamb survival rates or sell lambs sooner, in relation to monitoring and measuring.

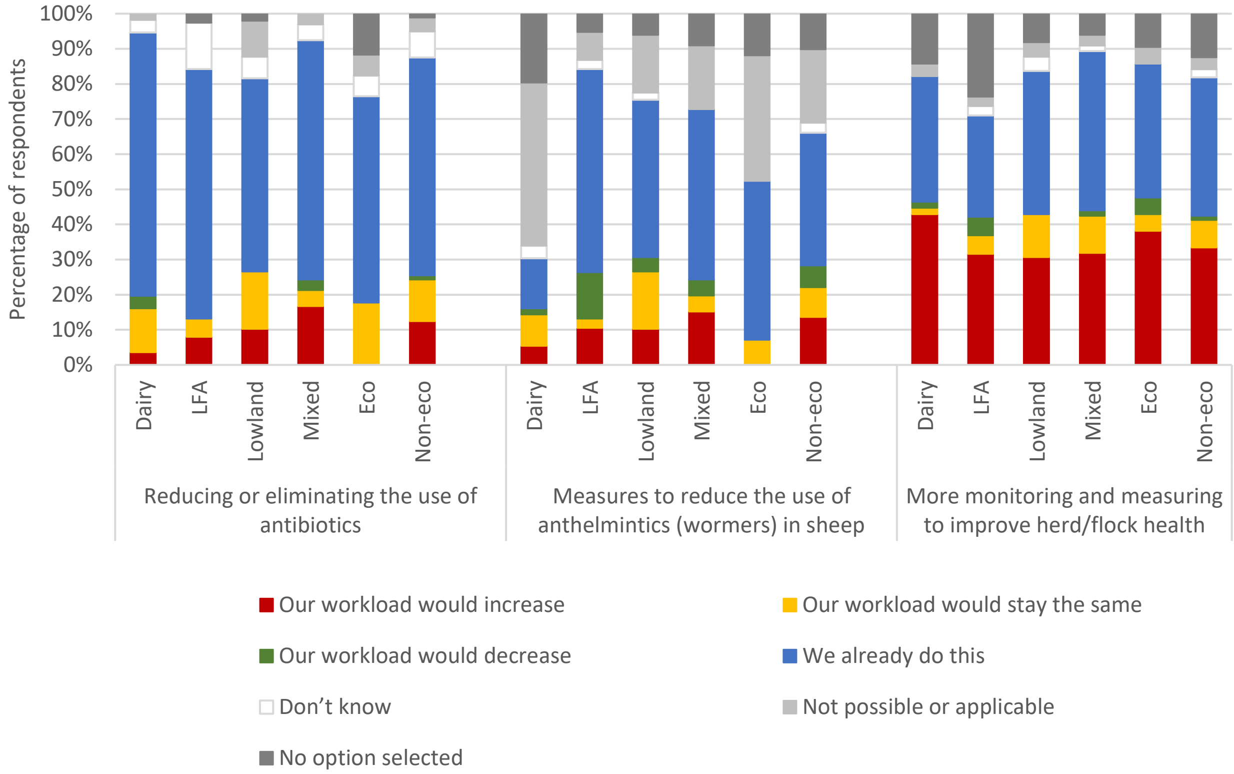


Figure 11.2. Survey respondents' opinion on the workload impacts of disease control practices, by farm type and being eco-extensive or not (*n*=230)
Data source: survey dataset (question 29)
Eco = eco-extensive; Non-eco = non-eco-extensive.

The interviews supported the surveyed respondents in their prediction that demands on farmers' time would increase if external requirements on disease management continue to expand. This risks placing additional strain on farm labour systems. Farmers are unlikely to hire additional labour in response because the financial rewards are not always clear, many face challenges in recruiting suitably skilled and flexible workers, and farmers will already be facing extra costs from required veterinary work. In 2019, the chair of CHECS, who is also a dairy farmer, said in an interview:

> "The biggest difficulty for farmers is money. The high standards that we have to meet for our supermarket contract come at a cost. Mobility scoring, for example. Everybody watches their cows walk to check for lameness and so on. But with our supermarket,

> at least four times a year we are required to get a vet out to do the scoring with us. That costs me quite a bit. I don't mind because we have a good contract, but people generally can't afford extras like that" (Sharpe, 2019:41)

Smith, McElwee and Somerville (2017) documented 210 cases of illegal activity by UK farmers that were reported in the media. This included an unspecified number of farmers carrying out veterinary procedures in a way that incurred animal cruelty, in order to avoid vet bills. It is an open question whether more farmers will engage in illicit activity as they face growing requirements to pay for veterinary services and related services such as blood tests.

One area where external requirements in disease management could have a perverse consequence is in data recording and analysis. There is clearly potential for time-saving solutions using bovine EID and existing EID tags in sheep. However, the interviews show that for many livestock farmers who are not particularly IT-literate, being asked to work more with data not only is inconsistent with their preferred practices on health management, it also costs them time. This is acknowledged by RUMA in its latest report in relation to monitoring antibiotics usage (2020). Respondent 52 in Herefordshire recommended informal training – emphatically not in a classroom setting – for farmers to come together, talk and learn about the new approaches to disease management. An alternative approach was proposed by a dairy farmer who is a member of the Arla Board of Representatives, who was interviewed for this case study. He was aware that demands on dairy farmers were increasing as the industry responded to consumer concerns: "We are in a particular tricky moment." He did not believe that farmers should be working long hours or paying others to collect data. Rather, he envisaged a greater role for technology in farm assurance in future, where EID and other tools could be used to collect data on the farm and send it automatically to a central assurance body. "The whole vehicle of farm assurance needs to change," he said (interview, 21 November 2019).

11.3 Policy case study 2: Intensive rotational grazing

Source: Lawrence Wright on Flickr, under Creative Commons

11.3.1 Introduction

Grassland is at the heart of livestock production systems in the UK, providing pasture for sheep and cattle in the summer and material for preserved forage – hay, haylage and silage – over the winter. Grazing regimes vary, including the density at which animals are stocked and the frequency with which animals are moved from one paddock or field to another (Frame & Laidlaw, 2011). During the twentieth century, forms of rotational grazing became well established in dairying (Roche et al., 2017) but for sheep and beef cattle, less dynamic systems of continuous grazing and set stocking are the norm, especially in upland areas (Marsh, 2017; Wilkinson et al., 2016; Child, 2020). A small number of farmers are experimenting with more intensive rotational regimes, using techniques such as strip grazing and mob grazing to stock an area of pasture at high density for a short period of time before the animals are moved on, leaving the grassland for a long period of recovery (Zaralis, 2015). This is sometimes referred to as regenerative grazing because it is identified with rehabilitating soil health, and is often promoted within a wider set of principles known as regenerative agriculture (Newton et al., 2020).

In the questionnaire, 44 (20%) respondents said they followed intensive rotational grazing for some or all of their animals. Telephone interviews were held with seven of the survey respondents who practise intensive rotational grazing on pasture to discuss their experiences and the effects on labour. They were four mixed farmers, two dairy farmers and one lowland grazing farmer. By county, four interviewees were from Wiltshire, two from Herefordshire and two from Shropshire. Intensive rotational grazing was also discussed with three more survey respondents during the more general interviews. They were two dairy farmers and an LFA farmer. Half of the interviewees (n=5) were eco-extensive: three certified organic, one certified Pasture For Life and one both.

11.3.2 Background

In recent years there has been an observable increase in experimentation and discussion around rotational grazing and soil health in UK livestock farming, in the form of podcasts, online forums, books and farm visits. Farmers and farming groups are interested in whether adopting intensive rotational grazing systems such as mob grazing can help profitability by improving the quality and productivity of soils and swards, increasing liveweight gains and reducing input costs (Hind, 2018; see Organic Research Centre, 2014; AgriHub, 2017; Woodland Trust, 2017; Price 2019; SwarmHub, 2019; AHDB, 2018c).

Farmers and farming groups have also used arguments for the carbon sequestration potential of intensively grazed grassland to defend British livestock farming from criticism of its greenhouse gas emissions intensity (e.g. Cummins & Leu, 2021). The claims that intensive rotational grazing is more effective in sequestering soil carbon than techniques such as set stocking are contested (Garnett et al., 2019), but studies suggest that mob grazing increases soil organic matter (Zaralis, 2015). There is also evidence that intensive rotational grazing the best grazing regime to encourage multi-species swards (Duller, 2021). Researchers have documented lower emissions of nitrous oxide from diverse pasture (Cummins et al., 2021), while studies have found that increasing sward diversity and grazing livestock on young plants, which occurs when pasture is grazed in short rotations, can both reduce methane emissions from livestock (Haque et al, 2018; Vasta et al, 2019).

The disease control practices explored in Policy Case Study 1 had largely originated as requests and advice from outside the farming community. While some farmers approved from an animal welfare perspective and had their own financial rationale for taking measures, the disease control practices feel externally imposed and only quasi-voluntary. In contrast, the practices explored in this Policy Case Study are truly voluntary; chosen by the farmers themselves. Regenerative agriculture is a bottom-up, farmer-led movement. Where farmers decide to join a scheme so that their pasture-based system is certified, they start become subject to the requirements of that certification standard, be it organic, Pasture For Life or similar. But the certification schemes themselves originated among farmers, unlike farm assurance and private buyers' schemes (see Chapter 2.1.2). Also, not all farmers following the practices discussed here decide to participate in a certification scheme.

11.3.3 What it involves

The 10 interviewees were moving their animals from one paddock or strip to another every four days, on average. This was skewed by two interviewees who sometimes waited up to three weeks before moving their animals; the mode frequency was every 1.5 days. The duration of post-grazing recovery periods was not discussed. It is typically recommended to allow swards to re-grow for at least five weeks (Zaralis, 2015; Wilkinson et al., 2016).

Most of the respondents grazed their animals in more than one group, also called a mob or a bunch, separated into milkers and dry cows, say, or different age groups. The interviewees were not necessarily practising intensive rotational grazing for all age classes, or all animals if they had both cattle and sheep, which was the case for five of them. This is consistent with findings from the questionnaire survey, where only three of the 44 respondents did not use any other grazing systems in addition (Figure 11.3). Typically, the dairy farmers were using intensive rotational grazing for their dairy cattle but more traditional rotational grazing for beef cattle or sheep.

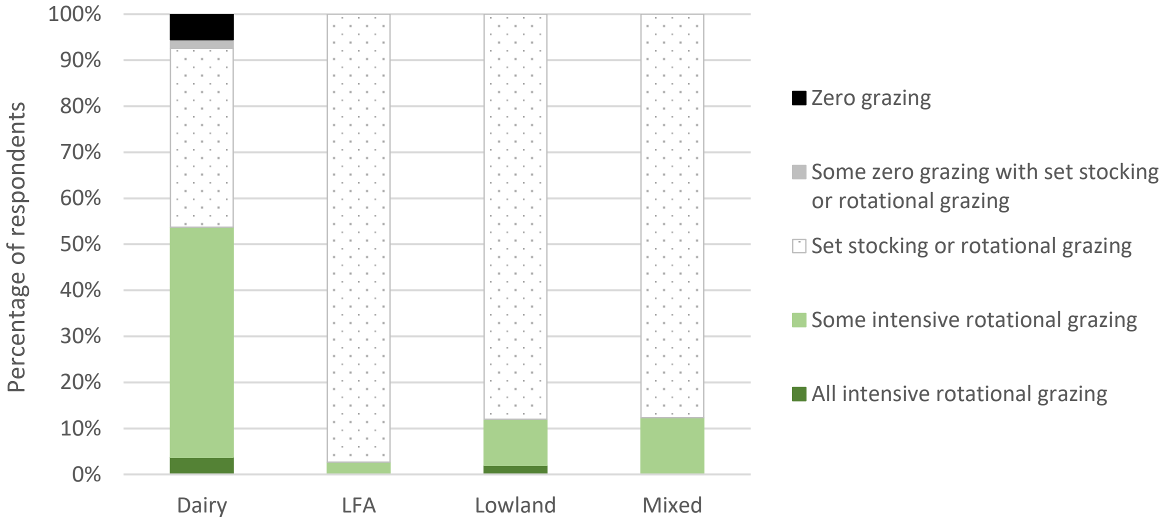


Figure 11.3. Grazing regimes practised by survey respondents, by farm type (*n*=207, excludes smallholdings)
Data source: survey dataset

Such frequent rotations of livestock involved three kinds of routine task. Firstly, the animals themselves had to be moved on. This could be as quick as 15 minutes per mob (Respondent 146) or as slow as two hours per mob (Respondent 376), depending on the number of animals and the distances travelled. One example comes from Respondent 389, a Pasture For Life-certified farmer. He mob-grazed cattle in three bunches: an early calving group, a late calving group and youngstock. The cattle were moved every day and he estimated that it took 20 minutes per group to move them, and then more time once a week to set up for a bigger move. Next, electric fencing would need to be moved into position to contain the mob in their new paddock or strip. Thirdly, some respondents needed to move sources of water, too, if they did not have permanent pipes and troughs set up within access in each paddock. For Respondent 524, setting up electric fencing for each move was the most time-consuming element. On her farm they had permanent water pipes in place and could simply attach a trough to them, although if the pipes froze in cold weather they would have to take a tractor to the site and spend all day fixing it.

The other work involved in intensive rotational grazing systems was more occasional. There was likely to have been some initial work (and expense) involved to set up the system. Dairy farmer 404, for example, had installed fencing, permanent water troughs and one-way gates to avoid ground poaching. Farmers must spend time learning about regenerative grazing and researching technologies. Then there would be periodic work, such as maintenance of batteries for the electric fencing. Respondent 131, in his fourth year of mob-grazing sheep, had been training this year's lambs to respect the electric fencing, which he said was taking time. Once the infrastructure was established, farmers would continue to make occasional adjustments and refinements, often with the express purpose of reducing the workload.

The small paddocks used for intensive rotational grazing are typically subdivisions of larger fields, and often lack boundary trees and hedgerows that could provide shelter for the grazing livestock. However, none of the set-up or maintenance work described by interviewees had included adding temporary or permanent shelter. This worried Respondent 146, a young mixed farmer from Herefordshire: "That is one thing that I don't like about this system… When it's very hot or raining very hard, the cattle can be exposed." He kept one field empty to move the cattle to in emergencies, and he was planning to plant some trees. Other respondents were more philosophical, such as Respondent 376, who said her animals just had to endure the conditions, or dairy farmer 200, who said the cows were never exposed for very long before being moved on: "Our cows are pretty hardy, they don't mind a bit of rain. Heat is more of a problem." In the Red Tractor dairy standards (v.4.2), it is stated that shelter must be provided to protect livestock kept outdoors from inclement weather; while the Pasture For Life standards (v. 2.0) stipulate, "Animals must always have access to shade and or shelter as appropriate to ensure they can maintain thermal comfort". It is possible that in future, farmers like this who practise intensive rotational grazing would need to spend more time in establishing, maintaining and/or moving shelter for animals in order to comply with external requirements and to respond to climatic conditions. Climate change is projected to increase dairy cattle's exposure to heat stress in the West Midlands and West Country regions of England over coming years (Garry et al., 2021).

The remaining work reported by interviewees concerned testing. Three of the respondents carried out regular FECs to manage parasites, in a cross-over with the previous Case Study. Others felt that it was not necessary, since the parasite risk was minimised by the long rest periods and practices such as mixed grazing of cattle and sheep. Organic farmers must often devote time and effort to control the worm burden in livestock with grazing strategies such as creating clean pasture or alternating species grazing annually, because their use of wormers is restricted (Younie, 2001; PFLA, 2016).

Two respondents conducted occasional soil sampling, but given the importance to the theory of mob grazing for livestock to be moved on and off pasture at appropriate sward heights, it is interesting that sward measurements were typically done only in an informal way or not at all. Respondent 389 explained: "I do a very basic sward assessment, where I am only looking for certain things. I do it by eye, and I am focusing on days rested, and liveweight gains. That is more important than grass length." Another mixed farmer, Respondent 181, said he did sward measurement only sporadically. "My issue is where do I record the data, and what do I do with it?" he said. He was considering using specialist grassland management software but was not yet convinced it would be worth the money.

The main labour-related consequences of intensive rotational grazing, then, are – according to 10 respondents interviewed – additions to daily or near-daily routine work, and some occasional tasks involving infrastructure or testing and analysis. This differentiates it from some of the labour-related consequences of disease control measures, which seemed to be adding work at peak times of the year (e.g. calving, lambing and rearing) or creating new peaks (e.g. quarterly blood tests).

11.3.4 Effects on workloads

Since practising intensive rotational grazing is a choice, and all of the respondents interviewed had made the choice themselves, as opposed to going along with the decision made by someone else in the farm household or business, the conversations about its labour impacts had a different feel from the conversations about disease control measures or paperwork. The respondents often seemed less aggrieved, or frustrated, perhaps with the exception of Respondent 376 who, along with her colleagues, seemed over-worked and Respondent 404, who had struggled to recruit suitable workers to implement the system. It was as if the respondents were so keen for the systems to work that they did not feel so badly about any extra time that was needed. It might have been different had an interview taken place with, for example, Respondent 131's father, who had needed persuading to start mob grazing cattle, or his wife, who told him that he did not spend his time very efficiently.

Perhaps the conversations also felt different because several respondents discerned that although intensive rotational grazing was time-consuming in some aspects, it was saving time or money in others. The mental calculations of cost and benefit seemed clearer in their minds than the costs and benefits of disease control. Interviewees spoke more readily about the benefits of intensive rotational grazing and could articulate their own rationale for having chosen to practise it.

Respondents perceived that moving animals so frequently and dealing with the infrastructure of fencing, water sources and so on, was more time-consuming than other grazing systems. This affected the sheep and beef farmers particularly who were not accustomed, unlike dairy farmers, to spending so much daily time in the field. Labour constraints were limiting the extent to which some respondents could fully implement their desired systems. For example, although Respondent 200 had said that moving their dairy cows to fresh pasture was not adding to the workload, she noted that when it came to sward measurements and grassland planning, her herd manager was not managing to do as much as he intended: "He likes to do it himself, but he has a lot on his plate and doesn't always get it done." Respondent 376, for whom moving large groups of cattle once or twice a week was so time-consuming, said they would not have sufficient manpower to increase the frequency of rotations. Meanwhile, Respondent 131 said he had not thought much about how his labour demands had changed and was slightly at a loss to explain how he had managed to find the extra time for mob grazing. When prompted, he concluded "maybe some jobs aren't getting done" and "I just find the time from making efficiencies elsewhere". Even if not conscious of doing so, by postponing other work he was employing strategies of adjusting his workload and reallocating his own labour.

Respondent 131 was saving some time elsewhere by not applying fertiliser. While not organic-certified, he was following a low-input system, benefiting from legumes in the sward, and hoped that the more even distribution of livestock achieved by paddock grazing would fertilise the soil more effectively. Other observed benefits from intensive rotational grazing included: being able to increase stocking density and therefore use available land more efficiently; improving grass quality and achieving better liveweight gains; saving on the need to mechanically top grass; purchasing less livestock feed; improving cows' fertility; and having greater opportunity to monitor animals and therefore catch illness and disease more quickly.

Three of the interviewees, Respondents 146, 210 and 389, had identified time-savings by adjusting the grazing system itself. Over three years, Respondent 389 had cut down the time required by investing in infrastructure such as fittings on water troughs, a better fencing system and solar panels to replace batteries. His family had a mixed farm with multiple farm and non-farm enterprises and seemed to have access to financial capital for such investments. Respondent 389, also a mixed farmer, had purchased mobile troughs and semi-permanent fencing and was hoping to save more time in future by reducing the number of mobs.

Overall, it is difficult to assess the net labour effect of intensive rotational grazing. Following such a system appears to increase time in some areas and save time in others. Also, regenerative grazing is not one, fixed system whose labour demands can be measured. The interviewees adjusted their systems over time, changing variables such as the number of groups, the frequency of rotation and the infrastructural framework. This finding is consistent with the mixed results from the questionnaire survey, whereby changing to more frequent rotational grazing was reported to have increased the workload for some farmers, but decreased it for others.

11.3.5 Workforce needs and advantages

Intensive rotational grazing is well suited to the labour systems of **pasture-based dairy enterprises**. The dairy respondents were already bringing cows in and out of the milking parlour at least twice a day, and so they already had the labour systems in place for frequent moves, and possibly also some of the infrastructure such as trackways and gates. Respondent 200, an organic dairy farmer, believed that there was “no additional work” with intensive rotational grazing and that it “doesn’t add to the workload.” Yes, she said, sometimes it was necessary to move electric fencing, “but because cows walk so slowly, you’ve done it by the time you need it.” Dairy farmers are also likely to have the infrastructure in place for testing and monitoring. This helps to explain why of the 44 survey respondents who practised intensive rotational grazing, 29 of them (66%) were dairy farmers.

It is a harder system for beef and sheep enterprises to adopt, especially when they involve very large herds or flocks. It is possible agronomically to cultivate and rotationally graze multi-species grass leys in upland areas (Duller, 2021), but the labour aspects might be challenging if upland farms have a large or difficult farmed area without contiguous land parcels for easy rotation and subdivision. Tenant farmers face challenges if their landlords place restrictions on installation of permanent or semi-permanent infrastructure, as some of the respondents described.

Low-input rotational grazing may cut the cost of production by reducing inputs – feed and fertiliser – and livestock housing (PFLA, 2016). While at least some of the interviewees had reduced their input costs, there were also capital expenses in the form of electric fencing, water pipes and so on. Those who had not spent so much money on infrastructure seem to have experienced a higher labour demand. Therefore farms without **access to capital** for investing in time-saving infrastructure might face barriers to adoption or a greater impact on their workloads. Mixed and diversified farms might have greater access to capital; receiving a market premium from specialist certification or an income from direct selling would also help. Five of the 10 interviewees were certified eco-extensive, as mentioned, and four did direct selling. There are reports of livestock farmers experimenting with direct marketing routes, including dairy farmers selling milk from vending machines or cattle farmers selling beef in meat boxes (Alison Millward Associates, 2014). Often they are farmers who are adopting intensive rotational grazing systems and using the resulting species-rich grassland to differentiate their products as premium.

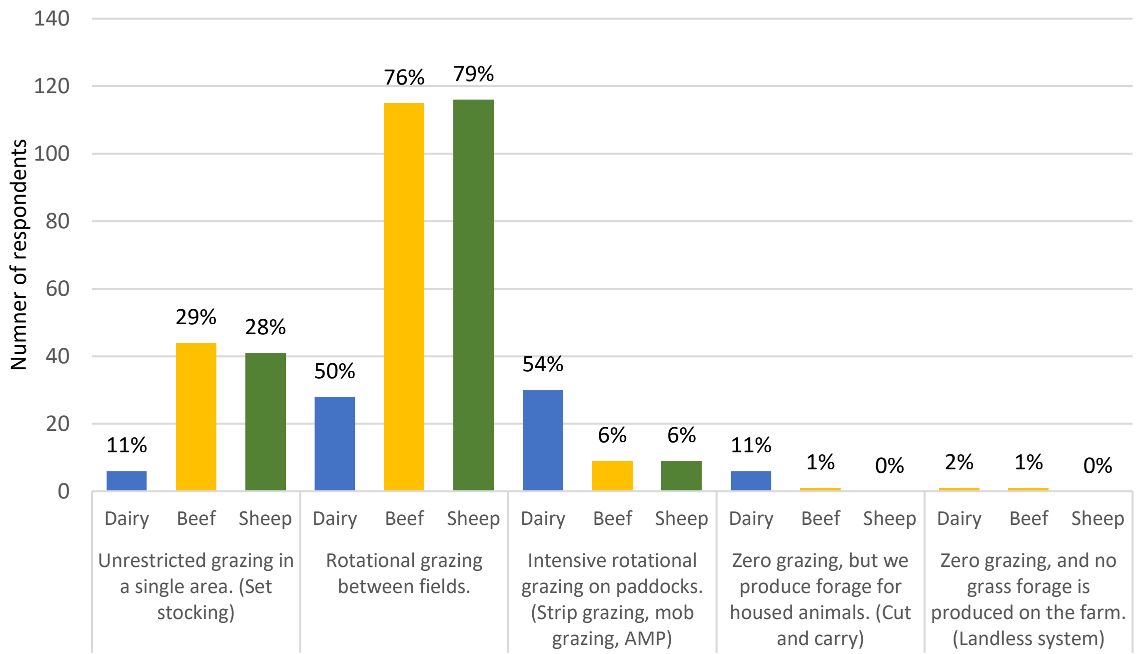


Figure 11.4. Grazing regimes used by survey respondents, by livestock enterprise (*n*=56 dairy, *n*=152 beef, *n*=147 sheep)
Data source: survey dataset

For this case study, an interview was conducted with a livestock farmer from outside the study regions who practises a form of intensive rotational grazing as part of a holistic management approach (interview, 1 December 2020). His experiences with the system suggest that it frees up capital by enabling farmers to reduced variable and fixed costs – less feed, less machinery and so on. If animals can be out-wintered, since frequent moves and improved soil structure should reduce the chance of soil poaching in winter, farmers might be able to free up sheds and rent them out. In his opinion, the production system itself, rather than any accompanying direct selling, offered the best potential for farmers to cut costs and improve margins.

The 10 interviewees were, on average, younger than most interviewees. Five of them had young children, which motivated them to avoid working excessively long hours. They also tended to have an **experimental mindset**. This may have led them to experiment with intensive rotational grazing in the first place, but it was also evident that practising such a system requires a trial and error approach. Farmers must experiment with the placement and design of electric fencing and sources of power and water. They must also play with aspects such as the size and make-up of each mob, the time of day when livestock are moved and how much grass, or residual, should be left, and carefully observe the effects on sward quality, liveweight gain and other variables. Respondent 376 described her approach as “learning by doing” but the respondents were also gaining information and advice from external sources, such as podcasts or grazing discussion groups that were arranged among farmers in their local area or through their supply chain buyer or possibly their certification scheme. Three of the respondents were participating in grazing research projects.

To manage the extra time, some respondents seemed to be taking it on themselves, perhaps when it was seen as 'their' project, while others were sharing the work with other members of the core workforce. They are likely to have managed the work by either stretching their daily working hours, since the labour demands were more routine than peaky, or by making small adjustments to their workloads elsewhere. Some of the younger farmers were concerned with becoming more "efficient" and looked for opportunities for working more efficiently in other parts of the farm business. There are limits to this strategy, as seen with the example of the dairy herd manager who had "too much on his plate" with his other duties. Contractors were not very relevant for managing the workloads of intensive rotational grazing. Even with the infrastructure work, the farmers seem to have done it themselves.

To adopt and maintain an intensive rotational grazing system, then, a farmer might not need regular access to flexible labour at peak times of the year, but they might benefit from the **ability to stretch their own working hours** and from having **other people available in the workforce** to share the load of making infrastructure changes and regular moving and testing. Based on the questionnaire survey data, intensive rotational grazing techniques such as mob grazing have a significant positive association with the estimated FTE of the farm workforce (p=0.001), the number of people who worked on the farm business in the preceding 12 months (p=0.006) and workforces that included both non-family members and contractors (p=0.001). However, it is not possible to definitively assign a causal relationship between large workforces and intensive rotational grazing in either direction. The association may be due to dairy farms and organic farms being disproportionately represented among the surveyed farms that were practising regenerative grazing – dairy and organic farms were larger than average by farmed area and had larger than average workforces, which could be attributable to other aspects of their production and diversification enterprises.

11.3.6 Implications for the future

While the adoption of intensive rotational grazing has been farmer-led to date, it is likely that external actors will begin intervening more in grassland management of livestock farmers and, specifically, encouraging practices that fall under the umbrella of regenerative agriculture. Some mainstream industry organisations have recommended farmers to change from set stocking, such as Meat Promotion Wales, which endorsed intensive rotational grazing for store cattle (Hybu Cig Cymru, 2014). More significantly, perhaps, there are indications that farmers will be encouraged to adopt improved grassland management practices that provide biodiversity or soil carbon sequestration in AES or even statutory measures under the UK's new post-Brexit agricultural policy. Soil health was described as a public good in the UK Government's *Health and Harmony* consultations on agriculture after Brexit and appears to be a key priority for the ELM scheme (GOV.UK, 2018a), and Natural England is reviewing ways to incentivise farmers to increase diversity in permanent grassland and long-term leys (Muto, 2021). The Managing Director of Control Union UK, an agricultural certification body, believes that regenerative farming practices "will become critical" given the government's emphasis on soil health (Constantini, 2020). There is also increasing interest in using grassland management and multi-species swards to deliver other public goods such as flood mitigation, drought resistance and reduction in nitrogen leaching (Rodriguez-Ortega et al., 2014; Brophy et al., 2021). Some farmers may choose to adopt more intensive rotational grazing systems as a means to achieve those objectives.

Therefore it is a valuable policy question to ask, what would be the labour implications if more livestock farmers began practising intensive rotational grazing? The question is also pertinent from the point of view of how livestock farming can become more financially viable and negotiate a better position for itself in meat and dairy value chains.

The questionnaire and interviews suggest that adoption of intensive rotational grazing would involve an increase in time commitments of livestock farmers, at least at first, and potentially a reallocation of labour within the farm system, such as farmers spending less time on the tractor topping or working on non-urgent tasks, and more time moving livestock and developing a grazing plan. In the questionnaire, 67% of respondents (n=31) answered that they thought their workloads would increase if they were asked to more intensive rotational grazing, including 41% of mixed farmers, and only three respondents (1%) thought that their workloads would increase. If asked to encourage more diverse species and legumes in the sward, respondents thought that this would be more manageable, but many said that they would already practising this. Their responses suggest that greater efforts would be needed to discuss with livestock farmers how to increase sward species diversity and the role played by grazing regimes, and intensive rotational grazing in particular, in maintaining species persistence.

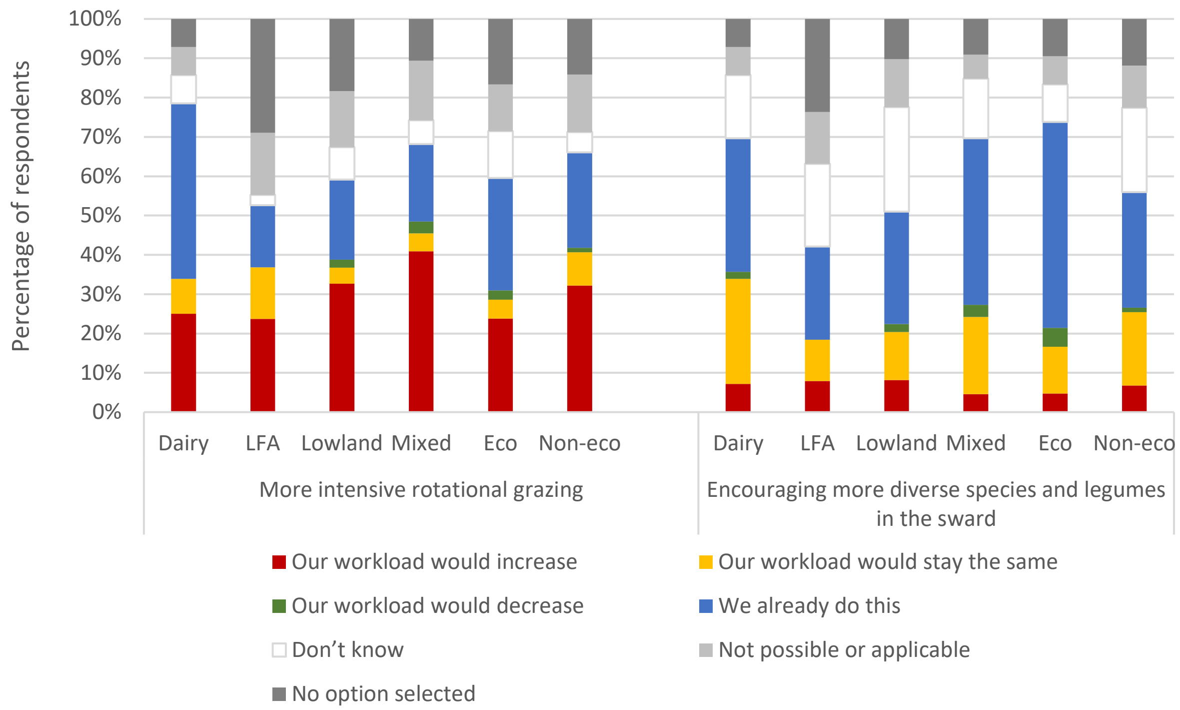


Figure 11.5. Survey respondents' opinion on the workload impacts of regenerative grazing practices, by farm type and being eco-extensive or not (*n*=230)
Data source: survey dataset (question 29)

Eco = eco-extensive; Non-eco = non-eco-extensive.

Farmers who are research-minded may be able to access information and advice themselves, but others may need support in the form of grazing discussion groups or advisory services. They would also need to be given the time to experiment with their systems and adjust them to balance labour demands with productivity and ecosystem service outcomes. Grants for capital items would help farmers to make regenerative grazing systems more manageable from a labour perspective.

In future, livestock farmers may need to become more 'eco-literate', meaning: able to speak the language of ecosystem services, carbon sequestration and biodiversity; to collect, analyse and report biological or soil-chemistry data; and to navigate government systems for applying to AES, which are increasingly online rather than paper-based. The UK government has sponsored trials of approaches for possible inclusion in the forthcoming ELM scheme that assess the viability of farms using carbon calculators or increasing carbon storage in grassland (Hill, 2020; NFU, 2020b). Any increase in administrative work associated with incentives or requirements on grazing would take farmers' time away from managing and refining their systems.

12. Conclusions

This study has sought to understand how livestock farms are managing to comply with new forms of sustainability standards, both voluntary and mandatory, at a time of great pressure on farmers' time and farm workforces. The external standards span public laws and private certification covering environmental sustainability, food safety, animal welfare, disease control and supply-chain traceability. A postal survey of 230 farms in Herefordshire, Shropshire, Wiltshire and Powys was conducted and 34 follow-up telephone interviews with farm members were held, alongside an analysis of data from the Farm Business Survey and a review of sustainability standard documents. The 214 farms from the postal survey that were in Herefordshire, Shropshire and Wiltshire represent 4% of all holdings of those types recorded in 2016, including 10% of all dairy holdings. In this final chapter of the thesis, some conclusions are drawn for the Research Questions and hypotheses that underpinned the study. Limitations of the study are noted, as well as its major findings and potential contribution to the academic literature.

12.1 Answering the Research Questions

This first part of the concluding chapter brings together the findings of the study to answer the four Research Questions and their sub-questions introduced at the start of this thesis.

Research Question 1

What do the experiences of farmers in Herefordshire, Shropshire and Wiltshire tell us about the changing nature of work and labour systems in UK livestock farming today?

1a. What are the labour patterns of livestock production and marketing systems?

The phrase *labour pattern* in this sub-question is intended to mean the workload and use of labour over a farming year. For the analysis, it was decided useful to consider almost everyone who contributes labour-input to a farm business as belonging to the farm workforce, which is divided into an internal workforce, covering the core full-time and part-time workers and peripheral casual or seasonal workers; and an external workforce, covering contractors and other farmers. The study considered a wide range of farm businesses with sheep and cattle, from upland sheep specialists to dairy operations to mixed lowland farms with orchards. Accordingly, it found great variety in the labour patterns of the studied farms.

In absence of time-study data (Ferguson, 1997), this study assessed the labour patterns of farm businesses by considering: (a) subjective information provided by interview and survey respondents about their workloads; and (b) data on the size and nature of workforces associated with certain farm business characteristics, which are available from the FBS for the whole of

England and from the questionnaire survey for 230 farms in Herefordshire, Shropshire, Wiltshire and Powys. The questionnaire survey and interviews are an imperfect source of information on farm labour patterns, since they rely on human perception of labour use from a single farm representative. The workforce data are also limited since they rely on respondents accurately reporting everyone who contributed labour in the past 12 months, they use coarse estimates of FTE, and the variations in labour-input that they reveal could be attributable to multiple facets of a farm business or to the variable use of external contractors, whose labour-input is not captured.

With those limitations in mind, statistical analysis suggests that the labour requirements of livestock farming systems are strongly influenced by the type and mix of enterprises, the size or scale of the enterprise and the farming management approach. The extent of labour–technology substitution also affects labour demand, though the correlations between this and farm workforces were not statistically tested.

Labour demand in **sheep enterprises** is likely to fluctuate over the farming year and to peak at lambing time, typically in March–April, unless the enterprise purchases store lambs for finishing, which has a different labour profile. There are other labour-intensive tasks throughout the year such as drenching ewes or moving groups to fresh pasture. Sheep enterprises are likely to require less labour in winter than many cattle enterprises because sheep tend to be kept outdoors; those farms that sell store lambs to be finished elsewhere will also experience lighter workloads coming into winter. According to respondents, lambing is one of the most labour-intensive aspects of all livestock farming, especially indoor lambing. Despite this, lambing does not appear to be associated with particularly high levels of seasonal labour for this peak period. The farms in the survey that kept sheep but not cattle, most of which did indoor lambing, typically had very small internal workforces (average 3.0 people/farm, and only 2.6 people/farm excluding smallholdings when the farm had no other enterprise) and although all farms that did indoor lambing reported more seasonal or casual labour than the fewer farms that lambed outdoors, we might have expected the usage to be higher. It appears that while lambing creates a strong requirement for flexible labour, it is not a strong driver of non-family casual or seasonal labour, especially on LFA and lowland farms. Only 15% of farms that did indoor lambing had students or volunteers. Instead, on many farms the labour demand is met by the personal flexibility of existing workforce members working very long hours and through the substantial mobilisation of family members.

For **beef enterprises** which produce their own calves, annual spring or autumn calving also creates a peak in labour demand. Year-round calving spreads the work out more. The analysis of respondents' workforces found farms which practised block calving once a year tended to use a higher proportion of flexible labour (typically part-time family members or non-family seasonal or casual workers) than the farms which did year-round calving. Aside from calving, some interview respondents questioned the received wisdom that cattle require more work than sheep (Gaskell et al., 2010; Redman, 2017). However, the labour requirements of beef cattle seem very variable, depending greatly on the number of cattle, size of farmed area and type of production system. Most of the interview respondents with cattle had suckler herds, which tends to be a low-input system compared with beef finishing systems (Hybu Cig Cymru, 2014). Depending on the enterprise, rearing calves and youngstock, winter housing and finishing beef cattle for slaughter can all demand substantial labour according to other respondents, particularly given external requirements on animal health and welfare (see Research Question 2, below). The farms in the survey that were specialist beef farms had, on average, larger farmed areas, larger workforces and a higher proportion of non-family labour than the farms that only kept sheep. Excluding smallholdings, the farms that just had beef cattle averaged 3.4 people per farm, compared with 2.6 people per farm for specialist sheep-only farms. Analysis of the survey workforce data suggests beef cattle farming is more likely than sheep farming to involve additional non-family flexible labour, either for block calving or perhaps at other times of the year for tasks such as gathering cattle for TB testing, moving cattle or raising youngstock.

Because of their daily milking routines and tendency to follow year-round rather than block calving, **dairy enterprises** present more stable labour patterns. Consistent with the work of France-based researchers such as Hostiou and Dedieu (2011), this study found that dairy enterprises are associated with large workloads and a high proportion of routine work. The survey found exceptionally large workforces associated with dairy enterprises, averaging 7.3 people per farm, and correlations between FTE and practices common to dairying such as year-round calving and winter housing. Dairy farms used less flexible labour than other farms with livestock, which could be related to their more stable workloads. Nevertheless there is still variation and fluctuation in workloads according to the practices of individual systems, such as housing high-yielding milking cows indoors in summer, and depending on how farms are responding to industry requirements concerning male dairy calves (Research Question 2, below).

Throughout the study, differences between farm types were observed, with dairy farms often at one extreme and upland LFA farms at the other, and nowhere is this more marked than when it comes to the internal workforces of the 230 farms captured in the questionnaire survey. The large workforces of the 56 surveyed dairy farms typically include a sizeable proportion of paid, non-family staff (averaging 56% of estimated labour-input by FTE per farm). LFA farms have smaller workforces (average 3.2 people among surveyed farms) and employ very little non-family labour (only 8% of estimated labour-input by FTE per farm). Running a grazing livestock-only operation tends to involve fewer people and less labour-input than a mixed or dairy operation. Despite these differences, all livestock farms – even dairy farms – typically drew most of their labour from the farm owner(s). Only 20 (9%) of the surveyed farms employed a farm manager, and they were typically the larger and more diversified businesses.

Some respondents from LFA farms and lowland farms in challenging locations described how climate and terrain affected their workloads. Colder winters on upland farms can mean that cattle need to be housed indoors for longer, which entails more work in the cattle sheds, or restrict sheep farmers from trying labour-saving practices such as delaying their lambing seasons or trialling outdoor lambing. Farms vary in the extent to which they use technology, with examples from the survey including farm management software, livestock handling systems and robotic milking equipment, and this can affect the nature and volume of work required.

The findings from the questionnaire survey are broadly consistent with data from the FBS at national level, in that the dairy farms in the FBS tend to have the largest workforces by AWU and number of people, followed by mixed farms then lowland and LFA farms. One difference is that in the FBS, LFA farms have the smallest workforces whereas in the questionnaire survey it was the lowland farms. This may be partly attributable to the fact that the sample of lowland farms contained a disproportionate number of small operations, which may have dragged down the average farm size. Also, the classification of the 230 surveyed farms into Defra farm types is approximate and does not necessarily align perfectly with the classification of farms in the FBS.

Many farms with livestock grow cereal crops, either for fodder or as a cash crop. **Arable** field operations are busy at peak season (e.g. late summer cereal harvesting) and at the shoulders of the year for tasks such as drilling and spraying. However, the reported labour intensity of arable crops in summer is not reflected in particularly large workforces on surveyed farms with cereals in their enterprise mix. Nor was arable farming associated with higher-than-average use of flexible labour within the internal workforce. It seems likely that, as with indoor lambing, perhaps, the peaky demands of arable farming are managed using the personal flexibility of existing workforce members, along with a small amount of seasonal labour and substantial reliance on agricultural contractors.

Mixed farms may have additional enterprises with varying levels and seasonality of labour demands. We typically see large workforces, driven by the use of flexible non-family labour, associated with such enterprises. Half of the mixed farms in the survey with **horticulture or orchards** used seasonal or casual labour, which is much higher than the 19% of all farms in the survey. Farms with **poultry** also used more part-time and seasonal or casual labour than average. It seems that farm businesses often either have more capital available or are more willing to hire labour for such enterprises, which perhaps offer more immediate or predictable incomes than spot markets for livestock or cereals. In other words, high-value, standalone enterprises may rely more on non-family labour and numerical flexibility, and core arable and livestock production systems rely more on family labour and numerical flexibility. Barriers to accessing additional labour for those core systems were considered for Research Question 3, below.

Non-farm work

Among the 230 surveyed farms, 34% had an **on-farm diversification** enterprise and 25% did some form of **agricultural contracting** for others. These percentages are somewhat lower than the closest equivalent figures from the 2018/19 FBS for England, where 50–71% of livestock farms reported output from on-farm diversification and 35–55% reported output from off-farm hirework. Although the questionnaire survey and FBS returned different percentages of respondents engaging in non-farm activity, both found that diversification and external contracting were most common on mixed farms. Among the farms in the questionnaire survey, diversification was significantly correlated with large workforces and the use of non-family labour. Diversified farms in the questionnaire survey were more likely than the average farm to have employed non-family part-time workers (50% versus 23%) and non-family seasonal and casual workers (34% versus 5%), but also full-time non-family workers too (40% versus 29%).

Additionally, of the 230 surveyed farms, 25% were involved in **direct selling** to customers and 14% sold farm produce directly to a supermarket buyer.

These marketing strategies and enterprises were all reported by respondents to have added to the farm workload in some way. Specifically, they require work which is not what we might think of as ‘farm work’; that is, field operations and animal husbandry. Interview respondents who sold meat or milk direct to consumers – or pedigree livestock direct to other farmers – described getting involved in new forms of sales work, be it online or in physical locations. Such activities may divert members of the core workforce from farmwork or lead them into over-employment.

Contracts with supermarkets, which were most common among the dairy farms in the survey, create additional work, as the farms must comply not only with the supermarkets’ sustainability requirements but also with their quality and data demands. Selling directly to a supermarket can increase outside interference in the running of the farm business – but if well remunerated, supermarket contracts generate higher incomes, which one respondent said went directly into hiring more labour.

Flexibility

One observation from the interviews is that farm workloads continue to be very 'peaky', to use Errington's (1988) expression, with peaks and dips during the farming year. Lambing, calving and summer harvesting are especially seasonally draining times, while horticulture, poultry and certain diversification enterprises can require substantial numbers of extra workers at peak periods. This suggests that having access to flexible labour is important for livestock farms today, just as it was in the 1990s when highlighted by researchers such as Errington and Gasson (1996) and others. Indeed, the workforce data collected in the questionnaire survey and FBS reveal that flexible forms of labour are an important component of farm workforces, though the labour-input provided by part-time, seasonal and casual workers is not as high as that from full-time sources.

Overall, the 230 farms in the questionnaire survey were less likely to use paid and other non-family forms of flexible labour than the much larger sample of farms in the FBS, and were more reliant on a core of **full-time and flexible labour provided by the owner and other family members**. In the FBS for England in 2018/19, the use of paid casual workers was widespread, ranging from 48% of lowland farms to 65% of dairy farms in 2018/19. Use of part-time labour was less common, especially on lowland and LFA farms where part-time workers were recorded on only 16% and 15% of farms, respectively (compared with 31% of the mixed farms and 44% of the dairy farms). Among the 230 farms in the questionnaire survey, there was a much lower prevalence of paid seasonal or casual labour, ranging from 11% of lowland farms to 26% of mixed farms, although the percentages increase when we include casual family labour. The use of part-time paid labour was also lower than on FBS farms – 5% LFA, 11% lowland, 24% mixed and 26% dairy – although again, these percentages are higher when part-time family members are added. Overall, considering both family and non-family sources, 90% of the surveyed farms used full-time labour, 60% used part-time labour and 31% used seasonal or casual labour. Large farms (in hectares) and being eco-extensive (e.g. organic) are both associated with above-average use of paid labour in the questionnaire survey.

An important takeaway is that irrespective of the balance between paid and unpaid sources, or flexible and permanent labour, **most livestock farm workforces are small**: the average farm in the survey drew on 4.6 people during the year (excluding two outlier mixed farms with extremely large numbers of seasonal workers), who provided an estimated equivalent of 3.4 FTE. To supplement their small internal workforces, the questionnaire survey confirmed widespread use of contractors – by 88% of all surveyed farms – which was similar to the near-universal expenditure on agricultural contractors recorded in the FBS. The contractors are mostly hired for seasonal field tasks such as silaging, baling and hedge-cutting that require specialist machinery.

The few farms that did not use contractors were disproportionately likely to be LFA farms or smallholdings or have a contracting business themselves.

1b. How, if at all, are changes to production systems, farm businesses and routes to market affecting the nature of farmwork?

The FBS conducted in 2018/19 shows that in all four sectors, the costs of farming – not including labour costs – have increased at a greater rate than farm output since 2000/1. This has created a **cost–price squeeze** for many English farms with livestock. Among the 230 farms in the present study, the greatest signs of this economic pressure were farms quitting dairy, farms selling entire sheep flocks or suckler herds, and farms changing their business models in search of profitability, for example by selling lambs as stores instead of finishing them. As Respondent 73 explained, "The returns [from sheep] were not good enough for the amount of work … We want to concentrate on what pays the best." At least 32 of the 230 surveyed farms had downsized and/or streamlined their operations in the past three years. One interviewee, who had sold her dairy herd and described a nearby dairy farm that was also selling up, commented, "It's quite difficult to make money in farming these days" (Respondent 20). This coincides with data from the FBS for the whole of England which document a reduction in average herd or flock size in some sectors since 1998/99 coterminous with an increase in the average farmed area.

The result for the dairy sector has been **consolidation and intensification** on many of the remaining farms, which is likely to have created a need for larger workforces. The FBS found that the dairy sector has become more specialised, with fewer farms keeping sheep alongside cattle, and that the estimated SLR of the average full-time dairy farm has increased. Examples of newer time-consuming practices in dairying from the respondents include housing high yielders in summer, spending more time rearing calves and moving to milking three times a day.

While workloads on some dairy farms have been increasing, other farms that have downsized have managed to streamline and reduce their workloads. Some respondents said the release from working such long hours had been life-changing. However, one unintended consequence of selling a dairy enterprise is that for some farms, the loss of dairy staff has left less manpower available for other jobs on the farm – the workforce has lost some functional and numerical flexibility.

Some farms with cattle have seen changes to their workloads in recent years as they cope with the after-effects of statutory **TB** control measures – often, an enforced reduction of the herd has led businesses to withdraw from beef production altogether, in another kind of downsizing; in other cases, farms have needed to invest time and labour in rebuilding their herds. (This is related to the findings for Research Question 2, below.)

Respondents described other changes in production systems in recent years which have affected the nature of work. One respondent said that sheep breeds have been getting bigger in recent times, which has made handling them more dangerous. Some farms have shifted to these larger, more commercial breeds in pursuit of profitability or in response to a reduction in available pasture, which has increased their labour needs. Others have shifted to so-called easycare sheep or easy-calving cattle breeds. A few sheep farmers described switching to hardier sheep breeds that can lamb outdoors. There seems to be a trend in moving to outdoor lambing when climate allows, which might be reducing the hours that sheep farmers need to work in the early mornings and evenings, but indoor lambing remains the predominant practice among the Herefordshire, Shropshire and Wiltshire farms in the survey.

Livestock farms are increasingly involved in **non-farm diversified enterprises**. As noted above, 34% of the surveyed farms had an on-farm diversification enterprise. It was most common in Wiltshire and on mixed farms, and least common in Shropshire, on LFA farms and in remote locations. According to the FBS, diversification has spread in almost all livestock sectors and sub-sectors in the past 15 years. This has implications for farm labour patterns since, as noted for Research Question 1a, both the FBS and the questionnaire survey found that diversified farms tend to record more labour-input than non-diversified farms and to employ higher levels of paid labour. The labour-related impacts of the spread of non-farm diversification in English livestock farming are likely to have included workloads on farms becoming more diverse – requiring members of farming households to develop new skills – and the creation of new avenues of demand for wage labour in agriculture.

It will be noted for Research Question 3c below that farms are responding to labour becoming less affordable and more scarce by investing in labour-saving **technology**. But at the same time, things are also working the other way in that the nature of farmwork is being affected by some technology-related trends. For example, interview respondents noted that field machinery has been getting bigger in recent times. It is increasingly more affordable for farms to outsource field operations such as baling hay to contractors with specialist machinery, rather than handle the work themselves. Respondents in Shropshire and Wiltshire explained that some agricultural contractors now have machinery which is too large for some farms, and so contractors who can service smaller farms have sprung up.

Developments in smaller farm equipment and software seem to be affecting the nature of work on dairy farms in particular. The work of a dairy herdsperson is increasingly involved in software systems for entering and monitoring data indicators, and in operating equipment such as automatic feeders or, in rare cases, robotic milking units.

In general, respondents depicted increasing use of mobile phones and smartphones in farming. Take dairy farmer 213, for example: when he started farming, he used a diary to record information and would then collate it once a month; these days his son uses an app on his smartphone to enter or download data as and when needed. This is blurring the distinction between office work and farm work, as it is now easy to conduct calls while driving the tractor or enter data in the field rather than back at home.

Around the edges were discernible some **deeper changes** that some livestock farm businesses are making with consequences for labour patterns. Driven by the cost–price squeeze, a search for greater autonomy and an interest in regenerative grazing systems, some farmers have been developing alternative routes to market so that they can sell produce more directly, and alternative livestock production systems with more intensive grazing rotations which lower their reliance on purchased inputs. Direct marketing enterprises such as meat boxes or milk vending machines, reported by 25% of all survey respondents, generate new forms of administrative and sales work for farm workforces and can take the principal farmer away from traditional farming tasks. Some of the 44 respondents whose farms had adopted intensive rotational grazing described how it has affected their routine work, often requiring more time for moving livestock and maintaining infrastructure, but freeing them up from tractor work and giving them an opportunity to monitor animals more closely.

Finally, some interview respondents suggested that a change in culture might be occurring, where farmers decide to limit their working hours in a bid for a healthier work–life balance. This was by no means a common sentiment – many respondents were still resigned to, or even embraced, a lifestyle of long hours and rare days off, a self-identification with a culture of hard work and a blurring of the personal and the professional which they believed is inherent to farming life.

1c. How, if at all, are human resource needs and employment patterns changing on livestock farms?

Employment patterns

When it comes to employment, the four sectors of livestock farming included in this study are so distinct that we have to treat them differently from one another.

The **dairy** sector requires constant labour to fulfil the daily routine work of milking cows. Near-constant labour is needed for additional related tasks including year-round calving, moving cattle to and from the milking parlour (often combined with daily rotations to new pasture) and raising youngstock, especially in the past few years when buyers have been making stricter requirements to prevent killing male calves at birth. It was noted above that while some dairy enterprises have closed, others have expanded and intensified, leading to greater demand for labour in their core workforces.

The dairy sector is also unusual in that in 2018/19, dairy farms in the FBS averaged a positive income from agriculture, whereas the other three sectors (LFA, lowland and mixed) averaged a negative income from agriculture in 2018/19 and earned most of their money from the Basic Payment. This implies that dairy farms have more money available to pay for labour than other farms with livestock.

Perhaps as a result, the average dairy farm in the FBS increased its use of part-time and casual workers between 1998/99 and 2018/19. Full-time paid labour increased too, albeit at a lower rate and only on the largest farms. During this period, the average full-time dairy farm in the FBS gained the equivalent of one full-time worker and one part-time worker. Access to foreign workers has facilitated the dairy sector in expanding its paid workforce in recent years. This leaves dairying vulnerable to labour shortages, as we shall see in Research Question 3d.

Although dairy farms are more likely than most other farms to employ staff, we should not assume that the owners do not work long hours themselves. This is the sector where over-employment was most evident in the FBS data on hours worked. In every size group, the average principal dairy farmer worked longer hours in 2018/19 than 1998/99, reaching 2,546 hours a year overall.

In the **LFA, lowland and mixed** farming sectors, in contrast, the FBS reveals that there has been a reduction over time in labour-input from paid full-time workers, and an increase in labour-input from part-time or casual staff, tending to result in a net decrease in total workforce capacity. Just as the cost–price squeeze has motivated changes in businesses and production systems, it has also motivated farms to cut back on paid labour and do more with less. The proportion of FBS farms in the LFA, lowland and mixed farming sectors that use no paid workers at all was larger in 2018/19 than it was 20 years previously. The questionnaire survey identified 72 farms (32%) that had only one or more owners and family members in the internal workforce.

In mixed farming, which has recorded a particularly steep decline in paid labour-input, there are signs from the FBS data that some remaining members of the core workforce might be working longer hours in compensation (the average hours worked by principal farmers in mixed farming have increased since 1998/99 to 2,285 hours/year and have pushed some of them on the larger farms into over-employment). On the average medium and large mixed farm, farmers' spouses are also working longer hours than 20 years ago. The mixed farming sector is diverse and the demand for flexible labour for non-livestock enterprises such as horticulture or poultry, and more permanent part-time or full-time paid labour for diversification enterprises, may be going against the erosion of full-time workforces for arable operations.

The findings from the FBS confirm observations from the literature that many livestock farms, especially upland farms, have been retrenching to **family labour**. In the interviews, respondents sometimes recalled that when a paid worker had left or retired, they were not replaced. According to the FBS data on working hours, principal farmers and spouses on LFA and lowland farms are not working longer hours to make up for the lost labour-input – rather, the FBS suggests that the principal farmers, spouses and business partners are working fewer hours than they used to, mainly on the smaller farms. However, the small sample of interviewees did not give the impression of under-employment. Some were relaxed, but others, even if not stretched, described working very long hours as a matter of course. For example, Respondent 53 said that a quiet period for him would still mean working a nine-hour day.

One trend from the FBS is that the average farm workforce is more diverse than it was 20 years ago, in the sense that it contains **more people** – family and non-family members – even if they are providing less labour-input than was common in the past. For example, in 1998/99, the FBS recorded a farmer's spouse working on 35% of dairy farms, 35% of LFA farms, 21% of lowland farms and 27% of mixed farms. By 2018/19, the equivalent percentages had increased to 46% dairy, 41% LFA, 43% lowland and 34% mixed. During the interviews, respondents often described a trend of farmers' children returning to the family business after time away at university and possibly professional employment, bringing additional labour-input but also new ideas and skills.

While family members provide crucial labour-input on an irregular or part-time basis, it can be difficult for businesses during a period of cost–price pressures to find full-time work for the farmer's children. Three respondents in Shropshire mentioned that it had become common for farmers' sons to set up agricultural contracting businesses because there was no longer sufficient work available for them on the family farm or as a permanent worker on someone else's farm. Clearly, part of the story of the erosion of full-time labour in English livestock farming is the continued growth in the practice of outsourcing work to contractors, who have become such an embedded part of the labour patterns of farming (see Research Question 1a). Some farmers and land-owners are outsourcing entire operations, which is creating new opportunities for other farmers (and sons) to earn additional income.

The study has found that **labour–technology substitution** may also be affecting patterns of employment. According to the FBS, average farm expenditure on machinery and equipment has increased in all sectors since 1998/99. In stark cases, farmers have replaced workers with machinery, like Respondent 389, who had been forced by the Coronavirus pandemic to find butchery equipment that could reduce his staff numbers for his turkey business; or like Respondent 32, the dairy farmer who decided to purchase robotic milkers after a staff member left. Respondent 32 talked about the milking machinery almost as if it was a person – "Yes, there are calls in the middle of the night, but … one gets out of bed, dresses and goes to the robot". For Respondent 210, having an automatic sorting gate for cattle was "like having someone with a clipboard who is accurate 99% of the time." You could see from the interviews that technology sometimes feels to farmers like it is part of the workforce.

In the review of the literature for this study, it was noted that academics had observed the problems of **lone working and ageing** workforces since at least the 1970s, and these still appear to be matters of concern as a result of all of the downsizing, labour cutbacks, outsourcing and labour–technology substitution that we have documented. Some farming tasks like hanging a gate or moving livestock become harder with fewer hands available, but there is more to it than that. Respondent 124 talked about the importance of going to livestock markets for some social contact in his part of Herefordshire, since "Farming is quite a lonely profession". Asked at the end of his interview if there were any labour-related issues that he wanted to raise, Respondent 53 said, "I am a bit worried about the amount of accidents in farming." He thought that long hours, working alone and inadequate handling systems were putting cattle farmers at risk. "You slow down as you get older," he said, "I think farmers need to be paid better prices, so that they can get better handling systems." Conversations with respondents highlighted that ageing is often a driver of the decision to downsize. When workforce members age but do not exit the workforce, it can result in a gradual labour deficit that may cause a workforce–workload imbalance.

Changing human resource needs

Sometimes agricultural and veterinary students had brought new blood to respondents' lonely farms, and they offer the kind of flexible and low-cost labour that is needed in livestock farming. It is not necessarily new, but the survey and interviews suggest a continuing need for **flexible** forms of labour. This includes personal and numerical flexibility so that farms can manage the peaks in labour demand during the year, but also functional flexibility so that farms can manage the diverse tasks of farming with today's smaller workforces. Going against this, perhaps, is the observation that some farms seem to require more **specialised** labour than previously, to keep up with the advances in technology in the dairy sector in particular. Staying with dairying, it seems likely that there is increasing demand for people with livestock skills to help raise calves and youngstock. To operate the increasingly large and complex machinery mentioned above, livestock farms and their contractors may need workers who have advanced skills in tractor driving and mechanics, which are not necessarily skills shared by people who are good with livestock.

It was also discerned from the review of external requirements and from the discussions with respondents that **new skill sets** may be needed to respond to the changing demands made on today's livestock farms. It helps if at least one person in the workforce is good with software and computers, and on some dairy farms it is practically a prerequisite. There is an increasing need for people who are eco-literate, who are comfortable with the scientific approach often demanded by buyers and vets, and who have marketing and sales skills. This might feel far removed from the practice of raising cattle and sheep, but the reality is that farmers have for some time been combining practical outdoor farmwork with technology, veterinary science and paperwork. Respondent 386, a lowland farmer in Wiltshire, described his way of farming as "real dog and stick farming" but, although he still used a tractor from the 1970s and pulled up weeds by hand, he was also complying with the sophisticated requirements of organic certification and a stewardship scheme and was "just about" comfortable enough with computers to do his own books using accounting software. In his way, Respondent 386 illustrates the complexity and contradictions of farming livestock today.

Research Question 2

What are the specific effects of external requirements, especially farmer requirement schemes, on workloads and the nature of farmwork?

The review of farm assurance schemes and other external requirements identified a complex compliance landscape in which livestock farms face a host of mandatory, voluntary and quasi-mandatory rules. As well as following Cross Compliance and other statutory requirements, most respondents in the questionnaire survey said their farm business belonged to least one farm assurance scheme (average 1.2 schemes per farm). The most common was Red Tractor or the Welsh equivalent, FAWL, which 83% of the surveyed farms were assured against. Over one-third of dairy farms were also complying with a buyer's private standards. Just over half of the respondents were participating in an AES.

Effects on field operations

According to the review of scheme documents, livestock farms must comply with tens or scores of requirements concerning field operations. Many of these are mandatory Cross Compliance rules, with additional, voluntary requirements from Red Tractor and specialist schemes such as organic or Countryside Stewardship. Livestock farmers with organic or Pasture For Life certification choose to follow prescriptions for low-input management practices.

In the main, interviewees suggested that field operation requirements from any particular scheme are **not overly constraining** or technically difficult. It may be that many of the requirements do not apply to every farm, and so the actual rules are fewer than it appears in the scheme documents. It is also possible that farms are not following, or complying with, all of the rules. Some schemes have published information on non-compliances which suggest that certain practices such as the proper use of pesticides or managing muck heaps in fields are often not followed. It did appear from the interviews, however, that farmers have adopted and internalised external requirements on how they farm. Sustainability concepts such as grass buffer strips or a restricted hedge-trimming season were taken for granted by interviewees. In this way, long-established schemes such as Cross Compliance may have been contributing to the norms of how field operations are done and shaping the nature of grassland and arable farming in the UK.

When it comes to Countryside Stewardship and other AES, their required field operations are often discrete tasks which are directly compensated financially, which should make it easier for a farm to outsource the work to an outside contractor and thus experience less impact on the farm workload. Indeed, it seems likely that if external requirements in field operations are introducing new practices or creating additional work, this is being absorbed by contractors – as 88% of the survey respondents said they had used agricultural contractors in the preceding 12 months, sometimes for relevant tasks such as drilling, spraying and hedge-trimming. Nye (2017:106) has written of the very long hours worked by agricultural contractors in south-west England. It should not be forgotten that contractors may be farmers also (25% of the survey respondents did contracting for others), and so this 'hirework' would be adding to their on-farm workloads, especially in peak field season.

Effects on animal husbandry and livestock keeping

The scheme documents reveal a growth in external requirements concerning animal health and welfare over time. Detailed rules on livestock welfare and disease control are now found in all the schemes reviewed for this study except Countryside Stewardship. Standards are being driven by supermarkets and dairy companies, as well as by private livestock buyers and government or industry health initiatives. In comparison with field operations, the requirements in this area appear to be having a **greater effect on farm workloads** – at least how farmers perceive it. Several interviewees from all farm types said they were working more than before on aspects on animal health and welfare, often in conjunction with their vet. The interviews revealed increasing pressure on farmers to use fewer injections and prophylactic medication. This was changing the way some farmers looked after their livestock; participants interviewed for Policy Case Study 1 said they were spending more time monitoring young animals, for example. Some interviewees also said they were having to spend more money than before on veterinary reviews, blood tests and so on to comply with the requirements. Others said they did not have the time to implement everything advised by their vets. Information on non-compliances in the Cross Compliance and

Red Tractor schemes indicates that livestock farmers can find it difficult to follow all of the rules in animal health and welfare, for example ear-tagging all animals or checking livestock daily.

For farms with cattle, the statutory requirements concerning bovine TB are adding significant time and pressure. The introduction of compulsory TB tests has created a new event in the farming calendar for which additional labour must be mustered, and a TB breakdown can have serious consequences for a cattle enterprise, be it needing to quarantine animals or to reduce and re-build the herd.

Effects on infrastructure

Another area that was posing challenges for some respondents' farm labour systems is external requirements concerned with farm equipment and infrastructure. These are most common in dairy schemes such as Red Tractor Dairy and Arlagarden, and include prescriptions for winter housing for cattle or year-round housing and milking parlours for dairy cows and calves. They also address structures such as slurry stores. If complied with, these requirements affect routine work as well as maintenance and building work that might happen in the off-peak season. Some of these tasks were mentioned in the documentary information as common areas of non-compliance. The interviews elucidated that respondents sometimes do not follow rules on equipment and infrastructure because they find them trivial, but also that there are real **financial barriers** to carrying out some of the more substantial infrastructure requirements. Again, external requirements in this area are likely to be affecting farm workloads by creating jobs for agricultural contractors or perhaps under-employed workforce members to tackle at quiet times.

Effects on administration and systems

The review of scheme documents found that as well as influencing operational work, farm assurance and other external schemes affect farm workloads by adding requirements for administrative work and inspections, often referred to as 'paperwork' by farmers. Administrative tasks account for 11–23% of all individual requirements in the studied schemes, and there are further rules involved with management systems to ensure traceability of inputs and segregation of certified produce. In addition, a review of the literature and the information from survey and interview respondents highlight the further administrative burden of statutory laws governing livestock farming and, to a lesser extent, the demands of pedigree breed societies.

The interviews revealed the varying timescales of this administrative work – some routine (e.g. medicine records, livestock movements book, accounts), some occasional (e.g. VAT return, Red Tractor audit, Countryside Stewardship application, TB test), some seasonal (e.g. livestock sales paperwork) and some unpredictable (e.g. tenancy paperwork, payment delays). In the survey, the respondents named their top three sources of paperwork as: tax and accounts; farm assurance and certification; and livestock sales and breeding.

As requirement schemes evolve, they are changing the nature of administrative farmwork to make it **more digital**. Interviewees discussed how innovations such as EID tags, farm management software, remote farm inspections and data platforms increasingly required someone with IT skills to be among the farm workforce or at least available to help. The documentary analysis also found that the voluntary and private-sector schemes in particular are introducing more **sophisticated and potentially time-consuming** kinds of administrative task, going beyond the traditional record-keeping and securing of permits to requirements for plans, assessments, testing and monitoring. Some of the external requirements concerning animal health seem to call for a more experimental, scientific approach to animal husbandry. These findings were confirmed in the interviews. However, it is unclear how much farmers were embracing the new requirements such that it is changing the nature of livestock farming. Some respondents embraced the new way of working and said they would do it anyway irrespective of external demands, but others complied with the requirements reluctantly or not at all. Documentation on non-compliances with Cross Compliance and Red Tractor showed several areas of administrative work that participants often fail to fulfil, from medical records to risk assessments to veterinary reviews. Perhaps these instances of non-compliance, similar to non-compliances in operational work, are examples of everyday resistance by farmers and farm-workers to external demands; an example of how norms in farming are being negotiated between internal and external actors.

Many respondents dislike paperwork because it takes them away from farming; sociologists might say that it contradicts their notion of a 'good farmer' (Burton, 2004). But they also dislike paperwork because it causes genuine stress – particularly for less IT-literate farmers – and takes up valuable time which farmers can little afford. Even respondents who can work with computer technology quickly and comfortably said they find it useful to retain some paper-based or 'analogue' ways of working when out in the fields or in the barn. The survey and interviews confirmed the observation from the documentation review that the proliferation of external requirements mapped out in Chapter 5 creates both duplication and cumulative overwhelm. There was also a sense among respondents of being surveilled or scrutinised, even though the actual level of surveillance varies widely, from dairy farms whose buyers insist on CCTV monitoring to specialist sheep farms which are not even part of Red Tractor and rarely visited by inspectors.

How administrative requirements affect farm workloads varies according to the nature of the farm, the capacity of the farm's labour system and the schemes that the farm participates in.

Research on requirement schemes in other countries have found that the labour burden of farm assurance falls disproportionately on small farms, whose farming practices diverge from those required in the standards and which lack the systems for compliance. This study – using the documentation review, questionnaire survey and interviews – has found that it is not the small livestock farms that were affected the most by external requirements, but rather the **larger farms** with multiple enterprises and/or multiple routes to market which were subject to greater requirements. It was observed that farm labour systems are negatively affected by the increasingly digital nature of external requirements when the principal farmer is not very IT-literate, but this is not something which only happens on small farms: **discomfort with smartphones, computers and working online** seems to cut across farm size, and the impact of this strongly depends on whether the farmer has someone in the workforce or beyond who can help. The survey and interviews also confirmed the findings from the documentary review that dairy farms are among those most affected. Dairy farms typically have compliance systems in place because of their need to monitor milk quality, but they also tend to be subject to greater pressures from external requirements than beef and sheep farmers.

Subsidiary effects

The conceptual lens through which this study has analysed requirement schemes is somewhat critical, framing schemes as potentially exploitative. However, the survey and interviews reveal that many respondents feel that farm assurance is a good thing, helping to maintain or raise standards in their own farms, their neighbours' farms and UK agriculture as a whole. One consequence appears to be that the emphasis on animal health and welfare in external requirement schemes is leading livestock farmers to develop closer and more proactive relationships with their **vets**. Some of the specialist certification schemes such as organic or Pasture For Life and schemes for supermarket producer groups are also drawing some farmers into new **networks** of support and knowledge exchange, perhaps helping to replace some of the more local farmer-to-farmer networks which have been lost. (Although the social networks that are provided by livestock auction markets are also highly valued.)

One criticism is that it is unlikely that external requirement schemes are greatly affecting labour rights, working conditions or health and safety on livestock farms in a positive way. It is very rare for a farm assurance scheme to include requirements relating to workers' rights, and the focus of Red Tractor, which not only operates the dominant scheme but also an important conductor of farm inspections, is oriented more towards food safety and animal welfare.

Consequences for farm workloads

Among the scheme documents reviewed, the Soil Association organic scheme had the largest number of requirements, including a relatively large percentage (35%) of administrative requirements concerning input sourcing, sales and the farm's management and control systems to ensure organic segregation. However, respondents from eco-extensive farms in the questionnaire survey and interviews did not suggest that organic certification was especially time-consuming, either operationally or administratively. This may be because respondents accept the operational demands of organic farming since it tends to be a certification scheme that they or another farm decision-maker entered into willingly; and/or because organic farms have the management infrastructure and IT-literacy to make compliance less burdensome. In this study, eco-extensive farms were also found to have a larger internal workforce than non-eco-extensive farms, which implies there is more labour available for sharing work.

The review also suggests that schemes set by supermarkets and dairy buyers could be among the most demanding on farm workloads because they add advanced rules on top of the basic requirements of Red Tractor and Cross Compliance. In the survey, 32% of respondent farms were involved in a supermarket or processor requirement scheme. As already noted, the respondents who participated in dairy processor schemes tended to find paperwork and compliance in general more burdensome than most respondents. Selling milk or meat directly to a supermarket is more unusual, but two of the interviewees who did confirmed there was additional work involved; one farmer explained that supermarket Cost of Production contracts are time-consuming because they demand farms to submit detailed business data in addition.

Overall, the method used in the document review – counting individual requirements in scheme documents – identified the theoretical ways in which livestock farm workloads might be affected, but it cannot tell us how much labour-time is needed or which rules are being adopted. Furthermore, given the qualitative approach in the questionnaire survey and interviews of asking respondents for their perceptions of the effects on workloads, it is difficult to separate that which is time-consuming from that which is stressful. Respondents seemed to accept some time-consuming tasks more easily than others. For example, the study supports the findings of researchers such as Sibley (2006) and Escobar and Demeritt (2016) that the ways in which livestock farms are being encouraged to collect and analyse data, especially regarding animal health, do not always make business sense to farmers or fit with the way in which farmers prefer to work and process information.

For older farmers, the new digital forms of compliance did not seem to be encouraging them to use computers more. Rather, the interviews found that as external requirements become more digital, the work is pushed to accountants and advisers (if farms can afford them) or to farmers' wives or younger members of the family. This may create gender and generational opportunities or tensions. In some cases it appeared that female members of the farming household were doing disproportionate amounts of paperwork, echoing the findings of earlier research (e.g. Gasson & Winter, 1992; Darnhofer & Strauss, 2014; Sifaki, 2014).

The document review found that the number and sophistication of administrative requirements has tended to **increase over time**, and most survey respondents (60%) thought the amount of paperwork from external requirements and other sources had increased over the past 2-3 years. In most of the surveyed farms (78%), the bulk of administration is done by the farmer or business owner and/or a spouse or family member. Comments by interviewees indicated that this paperwork often tends to be done *in addition to* rather than *instead of* operational farmwork. For example, several interviewees said they did their record-keeping at night. This suggests that external requirements (and other sources of paperwork) are adding to workloads and possibly pushing some workforce members into over-employment. If these findings are representative of trends at national level, we might expect to see a corresponding increase in the working hours of farm household members recorded in the FBS. At first glance, this is not what we find. In general, the average working hours of principal farmers, spouses and business partners have fallen, being lower in 2018/19 than in 1998/99. However, the FBS does show that the percentage of farms where spouses do some work on the farm business has increased. The FBS also shows an increase in hours worked by farmers' spouses (highly likely to be women) among certain farm types, namely medium and large dairy farms, medium and large mixed farms, and large LFA farms. Principal farmers also recorded increased working hours in the dairy and mixed farming sectors (except on the small farms), with an uptick in hours since around 2016/7. The questionnaire survey shows that these types of farm are quite likely to be participating in multiple requirement schemes, and thus to be experiencing a heavier administrative load than many other types of farm.

Research Question 3

How are livestock farmers allocating time and sourcing labour to manage their workloads?

3a. How stretched are livestock farm labour systems?

This study used ideas from theories of resilience in agriculture to analyse how livestock farms are managing their workloads. The unit of analysis was the farm labour system, which is operationalised by the farm's internal and external workforce. The study proposes that the capacity of a farm business to manage its workload is based on the farm's susceptibility to labour pressures and its resilience, meaning its capacity to absorb pressures, adapt or change. It is conceptualised in this study that despite having strategies for managing workloads, some livestock farm labour systems may become overly stretched and come under strain. This is defined as a situation where members of a farm workforce, collectively, are not able to fully manage the workload without working very long hours, are not able get things done despite working long hours or find it difficult or stressful to execute the farm workload. While concepts from resilience were used to develop this idea, the study was also influenced by discussions among political economists and neoclassical economists about labour surplus and under- or over-employment. The question of how stretched a labour system is, can be posed in a different way to ask how much surplus labour-input or ‘slack’ is available in the system to respond to new needs and pressures that might arise. The study presents the idea that when a labour system comes under strain there is an imbalance between the workforce and the workload, which much be resolved by either augmenting the workforce (e.g. increasing labour-input) or changing the workload (e.g. reducing labour demand).

Identifying when a farm labour system is overly stretched is difficult. One indicator is the hours worked by workforce members. It could be argued that if people on a farm are regularly working very long hours, they and their system are over-stretched. By this measure, data from the FBS suggest that on average, most livestock farm workforces are not over-stretched, although individual members, especially the principal farmer, might be. Except on small farms and LFA farms, the average principal farmer of a farm business in 2018/19 was estimated to work more than 2,200 hours/year, which we might accept as the standard hours worked by a full-time person. Hours were longest on dairy farms. Among the other members of the workforce, however, only full-time paid workers were estimated to have worked close to or above 2,200 hours/year, on average. The FBS shows that **working hours are somewhat long but not excessively so**. The highest estimate was 2,660 hours/year for the principal farmer on the average medium-sized dairy farm, which would equate to 222 hours/month or 52 hours/week. When others in the workforce such as family members or farmers’ wives record part-time hours, it is not possible to say what their total labour burden might be when we factor in off-farm and household work.

Without more information about the members’ other commitments, this is a rather coarse measure of over-employment; in any case, over-employment might not be the best or only indicator of stretchedness. From discussions with respondents, it was observed that firstly, it is difficult to measure over-work in agriculture because of the strong fluctuations that occur in working patterns across the entire farming year; and secondly, some respondents reported working long hours without displaying other signs of stretchedness such as stress or a sense that work was not getting done. So, to assess the stretchedness of farm labour systems among the 230 farms that form the focus of this study, a more qualitative approach was used. This approach considered not only the hours that people work but also their levels of stress and whether they felt on top of their workloads. As the unit of analysis was the system as a whole, it was important to consider not just the hours worked by the regular members of the workforce but also whether the system could mobilise extra labour at busy times. The study used information provided by respondents in the questionnaire survey and solicited the perspective of a single member of the farm workforce for deeper investigation during interviews.

It was concluded that some of the respondents' labour systems seemed to be overly stretched. Two types of stretched farm were proposed. Some of the interviewees whose farm labour systems seemed stretched (**'type 1'**) were from busy dairy or mixed farms. They were often involved in diversification, direct selling or stewardship and, combined with the pressure of external requirements and the challenges of recruiting sufficient skilled labour (see Research Question 2 and Research Question 3d, respectively), this had placed strain on the system.

Another situation where respondents seemed stretched (**'type 2'**) was on smaller or less multi-faceted farms, often LFA or lowland grazing operations, where the problem was not so much a surfeit of external pressures and business activities but rather a lack of labour to complement the very small core workforce. Such operations have often been honed over time to become specialist and productive farms, but because those farms often cannot afford to hire wage labour, their labour systems can become stretched as the workforce ages if there is not a younger generation of family members to help out.

It is difficult to say how common it is for farms to have overly stretched labour systems like this. Among the 34 respondents who were interviewed, 10 (29%) were assessed to belong to type 1 or type 2. Because of the culture of working long hours in livestock farming and having to manage in a context of low incomes and the cost–price squeeze, many farms seem to sit at some point on the spectrum where they are stretched but not overly so – the 'just about managing'. At the other end of the spectrum, the interviews also identified seven (21%) farm businesses where the farm labour system seemed to be coping easily, and could be described as **relaxed** not stretched. Of all the farms in the survey, these businesses were most reminiscent of the stereotypical peasant farms characterised by Chayanov for their autonomy and under-utilised labour.

3b. Is there elasticity in farm labour systems to cope with changes in workloads and the nature of work?

This research sub-question originated during the scoping phase from the interview with the farm manager who said that he was able to carry out extra agri-environment work because he had slack in his system: not because workers were sitting around idle, but because much of his workload was handled by flexible contractors and he could also ask his staff and his contractors to work overtime if needed. The implication is that the agri-environment work was a temporary or discrete task. Hence, the idea that the farm labour system could stretch to complete the task, then snap back again – the system has elasticity. Another solution using Atkinson's theory of the flexible firm would be to temporarily redeploy workers from another task.

But during the course of the study, it became clear that some external demands, and other forms of workload pressure, are long-lasting and might require a permanent rather than temporary injection of additional labour. A farm labour system might have to respond not by temporarily adding labour-input, but by permanently stretching the capacity of the workforce or by permanently changing the nature of a worker's role.

The research found that farms might use both of these strategies. A typical farm workforce has the capacity to temporarily stretch its workforce in the sense of **increasing the amount of labour-input available**. This is achieved through members of the workforce working longer hours and through the addition of extra flexible labour at peak times. Such elasticity enables the farm as a whole to cope when the demand for labour increases, either during busy times such as harvesting or during an unexpected crisis. Farms have needed to develop this resilience strategy because of the extreme peakiness of workloads in farming. As noted for Research Question 1a, farms draw flexible labour from various sources – contractors, casual seasonal staff, students, family members, other farmers – with family members perhaps more commonly used on lowland and LFA farms and non-family sources more commonly used in dairying and mixed farming.

There was also evidence for farms using **functional flexibility** within the business to cope with temporary fluctuations in workload. At an individual level, interviewees demonstrated the kind of versatility described by Malanski et al. (2019) which enables them to turn their hands to many different types of task. However, some farmers were frustrated by the limits to their versatility that were being exposed by some of the new kinds of skills being required, such as IT skills. At the system level, a farmer might be able to transfer labour from one enterprise to another – for example, by asking the arable manager to help out during lambing – but this is made difficult by divisions of labour in farming. When family members who worked elsewhere were drafted in to help on the farm, this might be considered another form of functional flexibility explored in the literature review in Chapter 2, but it mainly seems that they were combining the farmwork with their other jobs rather than diverting their labour (and indeed might be described as over-employed since they often worked at the farm on the weekend or in the mornings or evenings). However, the examples of Respondent 245, whose wife was considering reducing her off-farm job to part-time so that she could help out more on the farm, and Respondent 395, whose wife had done something similar a few years previously after a paid farmworker left, might help us to understand the trend identified in the FBS data of an increasing number of farmers' spouses being recorded as part-time members of farm workforces.

Returning to the second strategy, some farms also demonstrated the capacity to **permanently stretch** their labour systems to accommodate a long-term increase in the workload or make a permanent change in a person's role. This is evident in the way farmers were changing some of their animal husbandry practices and record-keeping in response to external requirements; or in the way they learned new skills for diversification and direct selling. Being able to take on new tasks and changes in the nature of work required demonstrates another kind of elasticity in farm workforces. Many farmers and workers have needed to become more multi-skilled as farm workforces have shrunk.

This kind of permanent change might have originated as a response to a new or growing demand on farms' time. For example, it was common for respondents to say that they did farm paperwork at night to "keep on top of things". But many farmers also worked long hours routinely, not in response to a new demand on their time but just to cope with existing farmwork. Routinely working long hours enabled respondents and other members of the workforce to manage their workloads when they might not have been able to afford or access additional labour. It is a way for farms to cope in the midst of a cost–price squeeze and a scarce labour market, but arguably in this situation the workforce is not in balance with the workload. If workforce members spend too much time in over-employment as a matter of course, then there is less surplus overtime available in the system for emergencies; it reduces the farm's absorptive capacity. When respondents described consistent over-work like this, it was taken as an indicator of the farm labour system being overly stretched – the workforce was having to work too hard to get the workload done.

Most farmers interviewed for this study did not mind working overtime, because they see it as part of farming. They shared an **ethos** of long hours, resourcefulness, self-reliance and self-denial. The study therefore supports the second part of Hypothesis 1, 'Livestock farmers accept additions to their workload because they feel powerless to refuse *and because they identify with a culture of working long hours and 'doing what it takes'*.' However, the study found a few respondents who were challenging that culture and trying to limit their working hours in order to achieve a better work–life balance. But crucially, the interviewees also reasoned that there would be quieter periods at other times in the year. As Respondent 53 said, "There are long days and short days." The difference with respondents on some of the overly stretched farms is that they seemed to be working long hours even at quiet times. Whether overly stretched or "just about managing", most respondents seemed closer to Kautsky's stereotype of the over-worked family farmer than Chayanov's more relaxed, utility-maximising peasantry.

The study also broadly agrees with Hypothesis 2 that 'Each farm labour system has some degree of elasticity', albeit with the observation that some systems were close to exceeding this capacity to stretch. It is, perhaps, impressive that livestock farms appear to have retained their capacity for absorbing and adapting to additional labour demands, given that the transition from full-time to flexible labour that so many have undergone has been about trimming away some of the labour surplus that farmers might otherwise have called upon. These days farms mould their workforce closely to the shape of the workload over the year, just as has been observed by researchers in other contexts, such as Greenhalgh (2010) among farmers in New Zealand. The loss of some of the excess labour-input that a permanent General Farm Worker might once have provided has come at a cost to the remaining members of farm workforces, but we must also recognise that since agricultural contractors now do many of the peaky tasks, some of the very long working hours have been passed on to them.

3c. Is there a threshold or breaking point, which triggers farmers to respond to work-related pressures in a drastic way? Do external requirements ever lead to a trigger event?

According to the questionnaire survey and interviews, farmers are adept at adjusting aspects of their production systems to keep their workloads in balance with their available workforce. Some respondents had reduced the peakiness of their systems by shifting to outdoor lambing or adjusting calving blocks. Farmers are also investing in labour-saving technology. This is not so common among the LFA farms, but several respondents from dairy, mixed or lowland grazing farms had invested in indoor equipment, machinery and software that helped manage their time.

However, there is a limit to which adaptation and absorption can buffer all of the demands that a farm encounters. The interviews found that despite stretching the workforce and making adjustments to the production system to prevent labour pressures from building up, some farm workforces are not able to fully manage the workload or become stressed in another way.

It was hypothesised in this study that if their capacity to stretch was exceeded, some farms' labour systems could reach breaking point and the farm would be forced to make changes. This would represent a more dramatic form of resilience than absorbing or adapting to pressures, involving transformative change. Evidence for this occurring was identified in the research. During the interviews, six respondents discussed experiences which could be interpreted as a **breaking point** in the farm labour system and which led to a decision to change an aspect of the farm business or production system. This was a build-up of long hours, recruitment difficulties, finding working physically difficult or working with inadequate and outdated equipment.

In their triggering change model, Sutherland et al. (2012) described events that trigger farms to make a major change in the trajectory of the business. The changes that respondents in the present study described making in response to a breaking point were sometimes major changes, but not always. Sometimes, farms were able to resolve the pressure and bring their workloads back in balance with their workforce by making relatively minor changes that did not affect the farm's development pathway, such as updating a milking parlour, increasing a worker's hours or changing to lambing outdoors. Therefor

e the study found that farm labour systems can reach breaking point and force a change to be made, but **excessive strain in a farm labour system is not always a trigger event** as defined by Sutherland et al.

Indeed, the study found that farms whose systems were under strain may lack the capital and other resources that can be necessary to make a major change. If we see a breaking point as an empowering moment at which a farmer escapes or transforms a situation, then the farmers who are stretched but do not reach a breaking point, could be in a worse situation than those who do. The study suggests that the livestock farms under most pressure remain in a kind of holding pattern: operating under strain but just holding on.

External requirements

Hypothesis 3 proposed that 'The additional work involved in complying with external requirements or exploring alternatives could stretch the adaptive limits of the farm labour system … *and force a change to occur*'. This study finds that although external requirements were adding to respondents' labour burden, as noted for Research Question 3, they **rarely create a breaking point** by themselves and it was not common for farmers to resolve labour pressures by leaving a requirement scheme. The findings therefore do not fully support the conclusion of Hypothesis 3.

To understand why it seems rare for farmers to leave requirement schemes, we need to also reflect on Hypothesis 1, 'Livestock farmers accept additions to their workload because they feel powerless to refuse and because they identify with a culture of working long hours and 'doing what it takes'.' It is argued in this study most respondents seemed to absorb the additional work involved in complying with external requirements, even when it was not clear that they would be financially compensated through the market. Both of the hypothesised reasons for this were valid to some extent. Policy and market actors who set external requirements benefit from the habitual adaptive strategy that farms employ of **absorbing** additional labour demands by using personal flexibility to stretching the workforce, a strategy that is legitimised by the ethos of hard work and self-reliance that permeates livestock farming. Authorities and buyers also benefit from farmers occupying unfavourable positions in meat and milk supply chains. To some extent, respondents did feel **powerless** to resist the external requirements. This was evidenced by comments made by some of the dairy farmers about pressure from their milk buyers to follow their rules, or from others about feeling obliged to have Red Tractor certification, for instance. The helplessness expressed by cattle farmers in the face of the statutory TB rules around testing, quarantine and possible slaughter are another example.

However, there are other reasons why respondents remained in requirement schemes and in wider market systems and governance frameworks that impose rules on how they farm.

Firstly, respondents often **agreed** with external requirements and complied with them willingly if grudgingly. Some voluntary schemes such as CHECS livestock health schemes, Pasture For Life or supermarket Cost of Production schemes were perceived to deliver a valuable contract or market advantage. Even if it was a scheme that had been imposed by the market rather than chosen by the farmers themselves, such as Red Tractor, interviewees occasionally believed that the standards were beneficial for their business and for farming in general.

Secondly, respondents might agree to participate in requirement schemes and government frameworks, but **not fully comply** with them. It is argued in this study that although few respondents expressed overt refusal to comply with the rules, some of the livestock farmers in this study were asserting everyday resistance (Scott, 1985) against scheme inspectors and, by extension, powerful market actors, by leaving paperwork to the last minute or not fulfilling all of the requirements. On occasion, respondents would not comply with rules that they perceived to be trivial or pointless. Sometimes, respondents did not follow all of the practices prescribed by their vets because the health outcomes were at best unclear. There was also a financial barrier to the implementation of some veterinary recommendations and scheme requirements, particularly those that involved making changes physical infrastructure (e.g. improving barn ventilation) or time-consuming tasks (e.g. checking animals). This possible selection of which rules to implement and which to ignore is perhaps one of the ways in which farms manage the workloads associated with external requirements.

Thirdly, it seems likely that certain practices demanded by external actors have become **internalised** within farming, so that it no longer feels so time-consuming or annoying to implement them; they are no longer seen as additional to the everyday workload. This might apply to some of the norms of animal welfare and field operations in Cross Compliance, for example.

A fourth possibility to explain why external requirements did not seem to lead to a breaking point in farm labour systems is that most farmers were **not measuring the time taken** by different tasks and would not have been aware of how long compliance with the scheme was taking in relation to all of the other sources of paperwork that the questionnaire respondents highlighted, such as tax and accounts, let alone their other business management and farming tasks. It is therefore difficult for farmers to calculate an accurate cost–benefit analysis of scheme participation. The methods used in this study were not able to distinguish tasks that were time-consuming from tasks that were stressful.

A final, related suggestion is that farms found it **easier to source labour** for implementing external schemes than they did for other aspects of farming workloads. Many of the field operations required in schemes such as Cross Compliance or Countryside Stewardship could be outsourced to agricultural contractors, which is not a type of labour that many respondents found to be scarce (see Research Question 3d). And when it came to the paperwork, it is not a task that is customarily managed by a staff member. In only a small number of cases, ranging from 3% of the LFA farms in the survey to 10% of the mixed farms, did respondents say that most of the administrative work of the farm business was handled by a non-family employee. Consequently, this is not an area of work that is particularly vulnerable to recruitment difficulties. Of the 53 survey respondents who had experienced difficulty recruiting workers or contractors in the past 2–3 years, none said it was for an administrative or secretarial worker. Instead, other than those who were overly stretched, if respondents found it stressful or time-consuming to manage the administrative aspects of external requirement schemes they usually appeared to be able to find people to help. Sometimes this was someone external such as a neighbour or adviser. Often it was someone within the family. According to the interviews, administrative jobs were often divided on gender lines, and female family members seemed to manage a disproportionate share of the administrative burden. Since so many farmers' spouses work part time and combine farm work with off-farm employment and/or household duties, it is possible that the net effect on their workloads was not so noticeable. It is also possible that women have less voice or authority in farm decision-making than men (partly because they are seen as providing only part-time help, perhaps) and therefore that their workload burdens were less likely to result in the principal farmer reaching a breaking point and deciding to make a change, but this would need to be investigated more with further research.

With all that being said, this study did identify a few cases where farmers had reached or were close to reaching a kind of breaking point. Interestingly, they were either **dairy farmers**, who this study has found tend to face the most stringent and numerous external requirements in livestock farming; or **sheep farmers**, who this study has found often lack compliance infrastructure and sufficient internal labour-input. The first was a dairy farmer in the questionnaire, who lost a premium milk contract because they were not prepared to comply with the increasing number of requirements from their processor. Then, some of the sheep farmers interviewed for this study were questioning the status quo concerning Red Tractor and were considering leaving the scheme. The findings suggest that if prices for non-farm-assured lambs remain buoyant, some sheep farmers who sell store lambs at auction might start dropping out of Red Tractor since the cost of compliance is not, in their view, sufficiently rewarded. It will be interesting to return to this now that over a year has passed since the interviews were conducted, to see if post-Brexit commodity markets have indeed emboldened some farmers to leave their Red Tractor schemes.

3d. Are labour shortages hindering responses to changes in workloads and the nature of work?

Some livestock farms are being hindered in their attempts to manage their workloads by difficulties recruiting paid labour. This had affected 24% of the surveyed respondents (*n*=53), including 40% of the dairy farmers. Recruitment difficulties were experienced more in Wiltshire than Shropshire, Herefordshire or Powys. It seems likely that urbanisation and a lack of affordable rural housing have affected the farm labour market in Wiltshire.

During the interviews, it became clear that many more farms were affected not by labour shortages *per se*, but by difficulties finding sufficiently skilled workers and by financial constraints, which were both creating a reticence among respondents to recruit new staff. This adds to the message from the study that livestock farmers are having to do more with less.

In many cases, the labour shortages and other barriers to recruitment were probably **affecting the general capacity of the workforce** to carry out its operational workload throughout the year, and thus increasing the likelihood of the existing workforce becoming stretched. The kinds of worker mentioned most in the questionnaires were year-round and possible full-time roles such as regular dairy milkers and herdspeople (*n*=13), other skilled stockpeople (*n*=8) and general farm workers (*n*=6). This seems to be a greater issue than finding workers for non-farm diversification enterprises (*n*=2).

Difficulties in accessing flexible forms of paid labour might be creating challenges for seasonal farming enterprises and hindering farms' capacity to respond to increases in labour demand through numerical flexibility. Twelve of the 63 respondents specified difficulties recruiting flexible labour, including relief milkers, seasonal fruit pickers and contractors. Five of them recorded difficulties recruiting help at lambing time.

As argued for Research Question 3c above, labour shortages do not appear to be greatly hindering livestock farms in managing workloads specifically concerned with external requirements, either on the administration side or in field operations. However, several of the survey respondents with recruitment difficulties mentioned needing people to work with calves or cattle. Labour shortages in this area could affect farms that are facing additional workloads in calf-rearing and working more intensely with livestock to comply with external requirements around animal health and welfare. In addition, the interview with Respondent 404, the former dairy farmer from Wiltshire, revealed how important it is for today's dairy farms to recruit workers who can operate within the complex, software-oriented and science-driven systems that are necessary for meeting milk buyers' advanced requirements.

A challenge in agriculture is that compared with other industries, there can be diminishing returns from labour-input (Robinson et al., 1982). On a single farm, the quantity of product output is limited by natural factors of production – the number of breeding ewes or cows, the amount of land available, the quality of pasture, and so on. Adding more labour to the system will not necessarily increase the quantity, quality or speed of produce at a rate that covers the cost of the labour. The marginal returns to labour are limited by the bounded factors of production and/or the prices paid by processors and at market. Indeed, paid labour can become a drain on farm profits. This is partly why there is such emphasis on efficiency in the industry (Hostiou & Dedieu, 2011; Morley, 2019) – and among some of the study interviewees. It is also why recruiting **skilled labour** was so important to the respondents and why unpaid family labour is so valuable. For farmers who are accustomed to needing to limit labour-input and keep it off the balance sheet, spending time on compliance with external requirements did not always offer obvious financial returns and took up their valuable unpaid labour-time that needed to be spent on production. The example of the sheep farmer with a Cost of Production contract shows that when farmers receive a decent price for their produce, they can afford to employ sufficient labour.

Research Question 4

Which farmers are best or worst equipped to meet the changing nature of work and emerging labour needs in livestock farming?

A well-equipped workforce

Being able to mobilise extra help, especially if it is skilled and flexible help, is a highly valuable asset to any livestock farm. A key finding from this study is the crucial role played by **flexible family members** in helping livestock farms to keep on top of their changing workloads. This was something that Ball (1987) had observed during research in a similar region of the West Midlands during the 1980s. A common characteristic of the stretched farms documented in the present study confirm a conclusion of Ball's that if farmers do not have access to flexible labour, then overtime is their only means of flexibility. Respondents from farms with a small core workforce of fewer than three people and no help from family at regular or peak times were found by this study to be vulnerable to becoming stretched.

Moving beyond the family, the capacity of livestock farms to manage fluctuating and evolving workloads is strengthened if they can access wider sources of labour. Farms are well positioned if they have reliable contractors, for example. In this study, the farms that seemed less secure in this regard included dairy farms in Wiltshire, which were experiencing difficulties sourcing skilled paid labour. Flexible and resilient farms do not necessarily need to hire permanent general farm workers – it might be about accessing secretarial help with paperwork once a week, a relief milker or a volunteer at lambing time. This might be the difference between the farm labour system 'just about managing' and the farm labour system becoming overwhelmed. The situation favours farmers who have the **capital and/or networks** that can help them employ the right people, but also farmers who can overcome any reticence about recruiting additional help beyond the family. An example of the latter, Respondent 245, an LFA farmer in Shropshire, had taken on an agricultural student for the first time after she wrote to him and found her a great help, and was now considering recruiting a part-time worker to replace her.

This study discussed the **connectedness** of livestock farms and how it can help to have multiple people in the farm's orbit. Farmers are well positioned if they have a good relationship with their vets, for example, since government- and market-driven requirements on animal health and welfare are becoming more numerous and farms are increasingly obliged to involve vets in planning and disease control. As the nature of livestock farming changes, it is also increasingly important for farmers to get help from people who are comfortable using computers and software if the farmer is not comfortable themselves. When a farm workforce is equipped with IT skills, it helps livestock farmers to comply with external requirements that are increasingly digital. Less IT-literate farmers might hate it, but the changing situation favours those farms that have a compliance 'infrastructure' – that is, the facility for monitoring, measuring, recording livestock data, business performance and metrics of sustainability – and the ability to navigate online platforms of government and the private-sector for uploading information and applying for grants. Farmers with smartphones and decent internet connections can also tap into virtual networks of knowledge-sharing. The study found that while being able to call upon the practical help of a neighbouring farmer is still important, there has been a rise in distant or virtual networks which offer opportunities to exchange knowledge at a time when farms are increasingly specialised and different from one another locally.

A concluding thought for another research project is that perhaps the changing nature of work in livestock farming favours people who are **mentally equipped to deal with lonely farmwork**. The indications are that outside the dairy sector, workforces are likely to remain small. Farmers benefit from strategies to deal with spending so much time working alone, such as meeting others at the livestock market or reducing their hours to spend more time with family or community groups. The farmer interviewed for Policy Case Study 2 who practises holistic management, argues that the answer is for farmers to reduce the labour-intensity of their systems so that they can free up time for employment elsewhere and get a break from solitary farm work. "We [farmers] need to do something else with our labour," he said (interview, 1 December 2020).

Well-equipped production systems

Turning now from the workforce side to the workload side, one thing that seems to help farms to cope with the changing nature of work is to have production systems that are **in balance** with the labour available, so that they are not consistently over-employed and have some labour surplus. This might be a modest single-enterprise operation, or a business that has been downsized. Farm businesses with additional elements such as diversification, direct selling or intensive rotational grazing are likely to need quantitatively more labour-input with more varied skills, and so their farm labour systems are vulnerable to becoming stretched. It helps if such farms can achieve functional flexibility, realise economies of scale and avoid labour diseconomies of scope – perhaps by avoiding excessive divisions of labour and over-specialised workers, or by planning things like lambing, calving and other peak times so that people can move from one enterprise to another.

Going further, something that helps farms is the capacity to respond to labour pressures, whatever they might be, by making **adjustments** either to the workforce or the workload if things become unbalanced. Organisational flexibility of the kind described by Hostiou and Dedieu (2011), where farms adjust aspects of their production system or even switch entire enterprises, offered many of the surveyed farms a way to respond when they could not source appropriate labour or could not make a certain enterprise pay for the work required. Farms that are more constrained in their ability to make changes are at a disadvantage. This could include tenant farmers with restrictive landlords, farms in remote locations that restrict diversification and direct selling options, and farms whose production systems are limited by a challenging climate.

It might be an obvious point, but having a profitable business or access to **capital** puts farms at an advantage. Whether a downsized single-enterprise business or a large diversified business with multiple elements, "margin is everything", in the words of the farmer interviewed for Policy Case Study 2 (interview, 1 December 2020). Profitability is difficult to achieve without reasonable farmgate prices that cover the cost of production, and will be even more difficult for LFA and lowland farms to achieve after the Basic Payment is removed. A boost in income that farms can earn from pedigree sales, diversification or a supermarket contract could subsidise labour costs or help to fund labour-saving equipment or investment in labour-saving production systems, so that the farm can respond when it loses labour-input perhaps when a long-serving worker or when an older family members starts slowing down. This study found that having rundown machinery or infrastructure is a risk factor for farm labour systems becoming stretched. In contrast, farms are literally well equipped to deal with the changing nature of work and emerging labour needs if they have access to appropriate equipment. In particular, this study argues that good cattle handling systems are becoming increasingly important given trends in livestock health testing and the prospect of climate change and agri-environmental incentives that might encourage livestock to be moved to fresh pasture more often.

Capital can help farms to make a change if their labour systems reach a breaking point (as argued by Sutherland et al. in their 2021 model of triggering change). But being **mentally equipped to change** also seems to be important. From the interviews and questionnaires, examples of respondents who were mentally equipped to change include farmers who took the difficult decision to sell a loss-making enterprise or to leave a burdensome marketing channel or certification system, farmers who could accept a non-family member joining the workforce, farmers were open to taking computer classes and farmers who recognised after lengthy consideration that their labour system was at breaking point and need to change. This is not to pass moral judgement on any of the respondents, only an observation that the personal ability of individuals to make changes seemed to have benefited several of the respondents' labour systems.

12.2 Recommendations

Based on the findings of the study, the following farmer-centric recommendations are proposed for fellow researchers and for stakeholders, supply-chain actors and policymakers.

Recommendations for researchers

- There could be more work done to **measure the labour demands** of livestock production systems and businesses. The measurement should be done by researchers with farmers, and could draw on the techniques developed by others such as the QuaeWork method (Hostiou & Dedieu, 2011; see footnote 6 on page 87). Many interviewees in the present study were stretching their working hours to meet workloads to an excessive degree and without being fully aware that they were doing so or of which tasks they were choosing to prioritise. According to the questionnaire survey, only 13% of respondents measured their labour productivity. When researchers and organisations carry out cost–benefit studies of aspects of livestock farming, labour – paid and unpaid – needs to be factored in better. This might include research to improve our understanding of the business costs and benefits of anthelmintics for the UK's sheep farming industry, and how dairy business models will be affected by new rules on male calves. To aid such studies, there is an argument for farm business accounting to make unpaid family labour more prominent on the balance sheet.

- In parallel, there could be **greater consideration of labour** in studies of farm transition and resilience. Considerations of the political economy within which farmers operate could also be given greater prominence in theories of farm transition. This study has tentatively agreed with the hypothesis that some farmers accept external requirements from the private sector which are inadequately financially compensated or stressful because of farms' weak bargaining position in supply chains. It might be useful to explore this subject further using methods such as focus groups to better understand how farmers feel about farm assurance and to tease out the perceived advantages and costs.

- There is scope for a study to assess the fairest and most effective ways to **compensate farmers for implementing additional sustainability and ethical practices** that might be viewed as public goods (e.g. income foregone, market premiums, member bonuses, targeted support for low-income farms, etc).

- Research on mental health in farming could look into the **effects on farmers' mental health** of the cumulative effect of external requirements described in this study and of the inexorable digitalisation of farm paperwork. Building on ongoing work on both mental health (e.g. Centre for Rural Policy Research, 2021; Hurley et al., 2022) and labour in agriculture (e.g. Nye & Lobley, 2021), future work could also investigate the difficulties that farmers experience in sourcing labour with the right skill levels at the right time and the subtle barriers to recruitment that the present study detected.

- It would be interesting to link the present study to the work of Nye (2018) by conducting research to see how external requirements are affecting workloads and mental health among **agricultural contractors**, many of whom are also farmers.

Recommendations for stakeholders, supply-chain actors and policymakers

- There should be wider discussion and acknowledgement of the **costs of compliance** with sustainability and ethical standards in agriculture.

- Public- and private-sector systems of governance should continue to **provide paper-based options** for recording, reporting and communicating and continue to offer in-person farm inspections. This is mainly to accommodate the large numbers of farmers for whom working digitally is difficult, slow and stressful, but also because even farmers who can work with computer technology quickly and comfortably find it useful to retain some paper-based or 'analogue' ways of working when out in the fields or in the barn.

- Public- and private-sector actors that set sustainability and ethical standards in UK agriculture could continue to work on ways to streamline farm assurance and farm inspections, and **reduce duplication and overlap**. Initiatives such as Earned Recognition and the agreement for organic audits to be combined with Red Tractor audits are examples of this.

- There may be measures that market-led schemes such as Red Tractor and buyers' own schemes could take to achieve greater approval and compliance rates among farmers. They could **address some of the complaint**s voiced by respondents in the present study such as: Red Tractor is burdensome yet a low bar to clear ("a tick-box exercise" in the words of Respondent 297): external rules are constantly changing ("they keep moving the goalposts", Respondent 109); and the rules are designed by uninformed outsiders ("I am just a bit concerned that there are people sitting there in FABBL who are thinking of ways to improve the standard, but not for farmers", Respondent 386). Arguably, however, the schemes have little motivation to do so given their powerful market positions, so perhaps this work could be spearheaded by farmer groups.

- Possibly, the more top-down schemes could follow the example of the farmer-led schemes in this study, which seemed more popular with respondents, and **widen the involvement of farmers** in the development of their standards. This might help to ensure that external requirements do not add to stretched farm workforces unnecessarily and encourage more farmers to share the sentiment that farm assurance benefits the farming industry. But perhaps it would first be useful to clarify the purpose(s) and beneficiaries of farm assurance. Is it still for food safety or is the remit essentially unlimited? Is it to benefit farm businesses, or consumers and retailers?

- If the remit of Red Tractor in particular is indeed as wide as stakeholders wish it to be, perhaps it would be possible to remove some of the more 'trivial' or least impactful requirements from Red Tractor standards, and replace them with some **new rules on working conditions**. It is argued in this study that Red Tractor has become the *de facto* auditor of public standards in agriculture; and yet, a whole area of farming – labour rights – is virtually missing from Red Tractor standards. If Red Tractor included more rules concerning working conditions – perhaps a requirement for farms to develop health and safety risk assessments alongside their livestock health plans and pesticide policies, for example – it could help to safeguard worker rights and improve safety standards. This is important given the high rates of injuries and deaths in agriculture and the problem of worker exploitation (Deakin, 2016; Tasker, 2021).

- According to survey respondents' opinions on the helpfulness of marketing channels (or lack of it), there is potential for livestock markets, certification schemes and buyer groups all to **provide more advice and information-sharing**, which should be tailored to the routes to market of different farm types.
- Industry bodies should continue to facilitate and encourage **collaboration between farms and vets** to manage livestock disease, but they must recognise that farmers do not always work in an experimental and scientific way. Following observations of Sibley (2006) and Escobar and Demeritt (2016), this study found that farmers need to agree with the purpose of what they are being asked to do by external actors and to trust the approach if they are to stick with it.
- Farm advisers and farming support organisations could identify farms at risk of becoming over-stretched and **help them identify ways** to bring their workloads and workforces into balance.
- To help livestock farms manage their workloads and maximise labour productivity, policymakers and industry groups could support ways to **help farmers access flexible labour** and to ensure that labour providers are offering the skills that farms need, in diverse areas such as calf-rearing, lambing and sales and marketing. This could include measures to connect farms with relief milkers, students or temporary secretarial staff to help those who feel overwhelmed by paperwork. There could be other suitable match-making initiatives; examples mentioned in this study included the Moorskills project in Dartmoor and joint farming ventures in Ireland (UK Parliament, 2010; Cush & Macken-Walsh, 2016). Improving industry understanding of the financial, skills and attitudinal barriers to accessing labour in agriculture would be very helpful.
- Policymakers and industry could also **encourage production systems and farming practices** that can be shown by evidence to reduce labour pressures. Outdoor lambing might be one example.
- Providers of agricultural higher education and further education should **ensure that their courses cover the administrative side of farming** sufficiently.
- It would be beneficial to offer livestock farmers **small grants for IT training or time-saving farming equipment** such as mobile handling systems, automatic feeders or EID readers. Releasing farmers from time-consuming tasks in the office or around the farm would enable them to spend more time on work that will make their systems more financially and environmentally sustainable. If time- and cash-strapped farmers had to

spend less time battling with slow internet speeds or dealing with paperwork, they could spend more time on livestock disease prevention as highlighted in Policy Case Study 1, which would benefit productivity, or on experimenting with the kind of innovations in pasture management that were discussed in Policy Case Study 2. There would also be health and safety benefits from updating old (sometimes dangerous) equipment and reducing unneeded manual work.

12.3 Limitations of the study

There are some limitations of methodology which affect the reliability, relevance and effectiveness of this study.

A general reflection on the study is that its scope is too wide and undefined. Probably, a better research project would have a narrower scope with a tighter set of Research Questions and perhaps less generic research methods. It feels to the author that only now, after three years' study, is she in a position to propose such a project. One of the reasons why the study is rather broad and did not focus on a single certification scheme or livestock farming practice, for instance, is that during the scoping stage, several farmers and stakeholders did not respond or could not see the point of the study. Perhaps this was a sign to probe further as to why so few people saw this area as being a relevant topic for research and why they were not responding as expected to the questions being asked. This might have generated findings with more immediate and obvious usefulness to farmers and other stakeholders. That said, the wide scope of this project has had a positive unintended consequence of making it possible to identify the way in which different sources of external requirements blur together in the minds of respondents and have a cumulative effect on farm workloads. It has also revealed crucial differences between farm types and highlighted the tremendous variety in production systems, marketing channels and labour forces of English livestock farms.

The farm list used for sampling may not be representative of all farms in the study regions, given the eclectic and incomplete sources from which it was compiled. Further, the study does not include the opinions of the 50% of farmers who were sent a questionnaire but did not respond to the questionnaire. It seems to have been a good idea to over-sample dairy farms, but arguably including so many eco-extensive farms in the sample has made the findings less useful than they could have been, as it was difficult to pinpoint the reason for large workforces of the eco-extensive farms, although it did facilitate Policy Case Study 2. Also, perhaps the 10 smallholdings should have been discarded, even though this would have reduced the size of the dataset, since they were outliers in many ways. Conversely, it would have been good if more than one respondent with a Cost of Production contract could have been interviewed, although this is very difficult to achieve.

Overall, it is frustrating that some respondents who might have been purposively selected for interview because they had interesting businesses or made interesting comments in the questionnaire, were not willing to be interviewed. The telephone interviews themselves were relatively short, so some avenues could not be fully explored. If there could have been a way to record them, it would have been useful to replay passages where the respondent gave lots of technical information and to include longer quotes in the thesis.

Each respondent's farm was assigned to a Defra farm type. This variable proved to be one of the most distinctive characteristics of a farm business, but there is a danger of using the results to compare the sample with other farms of that type at national level, since it is just an estimate of how the farm would be formally classified by Defra. The 'mixed farm' classification is especially problematic, given that the farms labelled as mixed farms in this study all had cattle and/or sheep, whereas only 78% of mixed farms in the 2018/19 FBS had cattle and only 48% had sheep.

Some lessons were learned from the development of the questionnaire. Perhaps more effort should have been made to find a specialist sheep farmer to pilot-test the questionnaire, especially from an upland area. Researchers are advised to avoid questions that become redundant because there is no variation in respondents' answers (Bradman et al., 2004; Bryman, 2015), and this criticism could apply to question 27, 'Do you measure your labour productivity', to which 82% of respondents replied 'No' – the high percentage of negative responses could probably have been predicted. Some of the questions were worded ambivalently, an inherent risk with surveys (Groves et al., 2009), and this created problems for the data analysis later on. For example:

- Question 7 asked if the respondent was a tenancy holder, but it also gave the option of 'farm owner or business owner', and it is clear that some respondents ticked the latter option even though they were tenant farmers. It would have been better to ask about the role of the respondent and whether it was a tenanted or owner-occupied farm in two separate questions;
- Question 17 on farm inspections should have specified whether TB tests were included, something that might have come up if more pilots had been conducted;
- Question 20 asked respondents if they thought the level of paperwork was "manageable" or "excessive", but respondents might have interpreted this to mean their opinion on the level of paperwork in farming in general, as opposed to whether they could cope with the paperwork on their own farm;
- Each question that needed it should have given an option of answering 'No' or 'None' – for some questions, such as question 9c on stewardship schemes, the respondent did not

answer the question at all and it was only clear from reading their other answers whether they were effectively answering no/none or had simply skipped the question.

The researcher followed advice to avoid making potential respondents uncomfortable and asking overly personal questions (Dillman, 2000; Bryman, 2015). This approach may have helped to maximise the response rate; however, it would have been useful for the analysis if the questionnaire had captured the respondent's age and gender and how many cattle and sheep they had. The questionnaire generated a large number of nominal categorical variables for the statistical analysis. This strongly limited the choice of statistical methods (most statistics textbooks focus on techniques for interval variables), and the researcher should have prepared more in advance for the kinds of variables that the questionnaire would generate. Attempts to use regression to control for the effect of dominant variables such as farm type were not successful.

Overall, the mixed methods design feels appropriate for this study. The sequential approach of starting with a postal survey succeeded in generating a pool of farmers who could be approached to be interviewed, and the survey generated rich quantitative data that provide valuable insights in their own right and enabled triangulation of findings from other sources and methods. However, in the final analysis the statistical findings seem to hold less weight than the findings on stretchedness and so on that were induced from qualitative data, and they perhaps could have been integrated better.

The study was intended to focus on the experience of livestock farming in Herefordshire and Shropshire, with Wiltshire included for contrast. Because the Coronavirus pandemic limited opportunities for fieldwork, the study did not, in the end, include very much analysis of geographical differences and how place affects labour issues. In any case, perhaps a place-based approach is not actually appropriate for the topic of the research. As the study progressed, it felt to the researcher that geographical factors and concepts that seemed important during the literature review such as embeddedness were less relevant than farm-level and economic factors, although perhaps this is precisely because little time was spent in the field. In any case, there was definitely value in including farms from the Wiltshire in the sample, since they yielded experiences of large mixed farms that are more unusual in Herefordshire and Shropshire and it also showed how labour scarcity affects less remote and more urbanised regions. Having Wiltshire farms in the sample probably makes the findings more representative for English farming as a whole. Whether the 16 farms from Powys in Wales should have been excluded from the sample is debatable; they muddy the waters a little since Welsh farmers operate in a different institutional context than English farmers, but it was valuable to have more upland farms in the sample and learning about their opinions on Glastir and Farming Connect was a useful insight.

Because of the research design and limitations on fieldwork imposed by the Coronavirus pandemic, the study does not quantify the labour effects of external requirements – it can only measure respondents' perception. Similarly, the analysis of requirement schemes recorded the number of requirements and rules, but not how long they take. (A further limitation is that when it came to assessing the requirements of supermarkets, only rather general information that is publicly available could be used.) The study does provide estimates of the size of farm workforces in FTE, but they are based on standard co-efficients which do not capture the wide range in actual hours worked by part-time workers, the overtime worked by full-time workers or the periods in the year when seasonal workers were used. As noted above, according to the questionnaire survey, only 13% of respondents measured their labour productivity (*n*=28).

Lastly, the study focuses at farm level – providing what Lobley and Potter (2004) call 'micro-empirical knowledge' – but only one member of each farm's workforce was surveyed or interviewed. In most cases, the respondent was an owner or business partner, and thus one of the main decision-makers. No contractors or temporary workers, either paid or unpaid, family or non-family, were interviewed. There was therefore limited scope for gathering intra-household information and understanding intra-farm power relations, although the study does provide some insights on gender, family generations and employee–employer relationships.

12.4 Major findings and research contribution

There are three parts to this research project:

- A descriptive record of livestock farm workforces, marketing channels and farming practices, with some attempt to find correlations between them;
- A study of how farm labour systems function, using resilience theory and the central idea that systems can stretch;
- An assessment of the particular work-related aspects of farm assurance schemes and other external requirements, and of how farms are managing them.

It is hoped that the findings can contribute to knowledge in all three areas.

The study of farm workforces provides further evidence for a long-term decrease in full-time labour in agriculture outside the dairy sector, the importance of family on upland farms, and the increase in labour casualisation and the outsourcing of labour to agricultural contractors. The study highlights an aspect of farm workforces which is not often discussed in the literature, which is that while their overall capacity may have been falling with the decline in full-time workers, the number of individual people in the average farm workforce has been increasing, so workforces are more diverse in that sense. The questionnaire survey links relatively high labour usage to farms with horticulture, poultry, organic systems and diversification. A potentially useful finding is that these kinds of enterprise appear to use more temporary paid labour than block calving or indoor lambing, despite the high labour demands of those two aspects of livestock farming.

There is a gap in the literature on farm marketing channels (the most recent data found were from Lobley et al., 2006), so the market data captured in the questionnaire survey contribute new information. The data support findings from other research that farm businesses typically use alternative routes to market in combination with more mainstream channels (Goodman, 2004; Grando et al., 2016). The interviews illustrate how direct marketing can divert labour from operational farmwork and potentially add strain to the labour system.

Moving to less well-documented terrain, this study has mapped out the invisible landscape of rules and regulations that farmers with livestock must follow, as well as the additional rules bound up in voluntary sustainability standards, and has taken a close look at exactly what the schemes entail and where the areas of overlap might be.

The study is unusual in paying so much attention to private-sector farm assurance schemes, which are under-researched in comparison with public AES. It reveals the increasing volume and sophistication of external demands facing livestock farmers – a trend observed in other areas of food production by Oglethorpe and Heron (2013). Supermarkets, milk processors and specialist certification schemes are spearheading the imposition of additional farming practices and methods to demonstrate compliance, particularly in animal welfare, livestock disease prevention and input management, The study suggests that dairy enterprises are under greater scrutiny than beef enterprises and sheep enterprises, and supports the findings of Webster et al. (2008) and Coyne et al. (2021) that this has an impact on dairy farm workloads. The findings help to explain why statutory measures for controlling bovine TB in England have been so costly for many farm businesses (Barnes et al., 2020). It also highlights the potential consequences for dairy farm labour systems of the trend for milk buyers to outlaw the euthanasia of male dairy calves. Twelve (21%) of the dairy respondents said this is likely to increase their workloads. As yet, there appears to have been little academic research on the labour implications of such measures.

According to this study, the administrative work associated with external requirements has been changing in recent years. Far from being paper-based form-filling and record-keeping, ‘paperwork’ should now be understood as a diverse and substantial aspect of farming. The study agrees with Escobar and Demeritt (2016) that government bodies, supermarket groups and third-party farm assurance schemes are pressing livestock farmers to increase their use of data for monitoring and to digitalise their systems. The differential effects of such administrative requirements are shown:

- Dairy farms and mixed diversified farms are among those subject to the most requirements, but they do have staff to help deal with the operational work while the farmer manages the administration, and they are likely to have monitoring and reporting structures in place;
- Small beef and sheep farms typically face fewer external requirements, but they can find the administration more challenging as they are less likely to have the monitoring and reporting infrastructure.

Research in other countries has found that the labour burden of farm assurance falls disproportionately on small farms, whose farming practices diverge from those required in the standards and which lack the systems for compliance (Spence & Bourlakis, 2009). However, this study argues that it is not the small, low-income livestock farms that are affected the most by external requirements, but rather the larger farms with multiple enterprises and/or multiple routes to market, even though those larger farms might have more of the necessary compliance infrastructure. This finding aligns with the observation from the FBS data that the longest working hours do not tend to be recorded on the smallest farms. With some exceptions, farmers tend to find the administrative side of farm assurance more burdensome – at least, more stressful, if not necessarily more time-consuming – than complying with the operational requirements. Farmers find scheme administration and other forms of paperwork stressful because:

- Farmers do not see this work as proper farming. They feel they are forced to be doing work that they do not self-identify with and is not what they are good at;
- They do not have an aptitude for paperwork or lack computer skills;
- Some farms have a poor internet connection;
- There are often high stakes involved for the business in getting the paperwork right or passing an inspection;
- Conversely, there is sometimes no obvious benefit for the business – the farmer feels it is taking their time away from other more important jobs;
- Farmers often experience delays and mistakes by administrators or are asked to repeat or duplicate information;
- It makes farmers feel under surveillance; and/or
- The cumulative effect of paperwork building up from multiple sources creates a sense of frustration and overwhelm.

A model (Figure 9.1 on page 217) is proposed to explain how farms manage their workloads by framing it as resilience to labour-related pressures, which are broken down into workload-related pressures and workforce-related pressures. The model then proposes a way to categorise how farms respond to those pressures.

Building on the work of researchers such as Nye (2017) who use concepts of labour flexibility from Atkinson (1984) and Errington and Gasson (1996), the study finds for the importance of personal flexibility, defined as where workers are willing and able to work long hours when needed and where their hours of work can be easily changed. Echoing findings of other studies (e.g. Ball, 1988; Greenhalgh, 2010; Darnhofer & Strauss, 2014), stretching one's working hours was identified as a common coping strategy within the core workforce. This is justified by the kind of stoicism and self-denial observed by researchers such as Lobley (2014) and Robinson (2017). Although the FBS data indicate that over-work is mainly an issue for principal farmers on dairy and large mixed farms, the varied workforce members interviewed for this study suggested that many others are working very long hours, especially at peak times. It did not appear that under-employment or surplus labour is widespread among the 230 surveyed farms. Whereas studies on the employment effects of AES have sometimes found that joining a stewardship scheme provided a way for farm businesses to occupy under-employed workforce members at quiet times, there was no sense in the present study that the additional labour demands of private-sector schemes are being used in the same way. Only on a small number of farms where the owners were in semi-retirement, an unusually labour-extensive system was followed or a Cost of Production enabled the farmer to deliberately hire extra labour as cover, did there appear to be the kind of over-manned labour systems theorised by writers such as Errington (1988).

The strategy of personal flexibility is linked to another important coping strategy identified in this study, which is having a network of labour sources that farmers can call upon. The idea of the farm orbit is proposed to visually represent this finding (Figure 7.15 on page 187). The study suggests that the most valuable form of connectedness is having access to a modest amount of family or non-family labour to help at peak times and relieve routine labour pressure, but other people in the network can also help in emergencies and provide specialist help. For farm businesses that can afford wage labour such as dairy farms, the study finds that some are being hampered by labour shortages, but it also reveals that farmers are often reluctant to even look for paid workers because of the ethos of self-reliance and past disappointments in not being able to find the right people with the right skills. Given a context of labour shortages and low incomes, we might have expected an increase in mutual cooperation, as has been documented in New Zealand (Wallace, 2014), but this is not what was found – organised exchange of labour and sharing of equipment among neighbouring farms was generally said by interviewees to have become less common than in the past, although neighbours do share knowledge and help in emergencies.

A contribution of this study is showing how these strategies are visible in how farmers are managing their paperwork. Several respondents got help with paperwork from family members, neighbours or accountants. This is enabling farmers who are not IT-literate to continue to use paper-based systems. Discomfort with smartphones, computers and working online seems to cut across farm size, and the impact of this strongly depends on whether the farmer has someone in the workforce or beyond who can help. Other ways in which farmers are managing their external requirements include: doing their paperwork at night, after farm work during the day; arranging for blood tests and/or health planning to take place on the same day, to minimise the need to call out the vet and gather livestock; and either not complying with some of the requirements or postponing other tasks.

To relieve pressure on the workload side, the study documents varied ways in which livestock farmers make adjustments to their production systems and farm enterprises. It finds that labour economies of scale favour specialisation and growth, but this can work against business arguments to diversify or to keep workloads manageable. When study respondents described how their farm businesses have changed over time, they depicted the kind of ebb and flow described by Errington and Gasson (1994) and Darnhofer (2021). It is suggested in this study that older farmers with relatively unchanging production systems should not be seen as un-dynamic or lacking the capacity to evolve, since they might have undertaken years of experimentation and adjustment before settling into a state of balance for the moment. Similarly, perhaps downsizing should be interpreted not as a negative retreat but as a reasoned strategy to bring the workload into closer balance with the labour-power currently available.

It is also hoped that this study contributes to research on farm-level resilience and change by paying close attention to how labour issues affect farm decisions. Empirical studies and theories of farm-level change in the literature do include labour-related drivers, but they tend to be aspects of the *workforce* such as ageing, injury or labour scarcity. The findings from this study suggest that pressures on the *workload* – including the demands of farm assurance, which are rarely mentioned in the literature – should also be considered as a possible driver of farm-level change.

Using the model, the study proposes that while workforces can be stretched and workloads can be adjusted, some farm labour systems can become overly stretched, such that workloads feel unmanageable. Two types of stretched farm are identified and risk factors for farms becoming overly stretched are put forward, relating to fundamentals of the business (e.g. being in a high risk zone for bovine TB, practising indoor lambing, having a difficult landlord); additional elements (e.g. direct selling, participation in multiple schemes); and workforce pressures (e.g. having a small core workforce, lacking IT literacy, sudden illness or injury). Farms that become stretched may lack a reserve of labour-input because the workforce is consistently working long hours and there are no additional people to call on. It might be relevant that on mixed farms, which are likely to have some of those risk factors from having multiple farm enterprises and participating in multiple requirement schemes, there is perhaps an indication from the FBS data of husbands and wives working longer hours to compensate for fewer hours being worked by paid workers.

The study finds that some farms with stretched labour systems reach a breaking point and make a change. The immediate cause is likely to be a combination of excessive hours, physically difficult work, an inadequate working set-up and/or not being able to recruit the right staff. Sometimes labour-related pressures act as a trigger for a major change to the farm business, similar to the dramatic deviations in farm trajectory described in Sutherland et al.'s (2012) triggering change model. This study finds that often, though, labour pressures are resolved by relatively minor changes.

The sticking point can be deciding on a particular course of action to take. Like Sutherland et al., this study shows that livestock farmers are sometimes constrained from making a change, not only to relieve pressure but also take advantage of an opportunity. Financial, labour and climatic or geographical constraints all figured in the farmers' stories. But there is an additional element of politics. The interviews gave small indications that power imbalances within the farm workforce, perhaps along gender or generational lines, can prevent farms from making beneficial changes and keep their labour systems under strain. Some of the tenant farmers in the survey had suffered from capricious or restrictive landlords – a power imbalance that can constrain farmers' choices and place additional pressures on the labour system. At a market level, apparent power imbalances in agri-food supply chains meant that some farmers in the study felt they had to remain with Red Tractor or in a buyer's scheme, even though they experienced a negative impact on their workloads. The poor financial returns in livestock farming constrain farmers from making big (and small) changes that would require financial capital and again, left them needing to cope with labour pressures by simply absorbing them.

A small number of researchers including Lobley and Potter (2004) and Hayden et al. (2021) have observed that the politics of supply chains can cause inertia in some farm businesses, but in general, political-economic drivers and impediments of change are under-reported. This study contributes to a small but growing body of work on Global Value Chains which brings a critical perspective on requirement schemes, following Bain et al. (2011), Sifaki (2014), Robinson (2017) and others. Above all, the study questions the narrative that farmers 'just get things done' and prompts us to ask, how do they get things done, and why should they?

References

AB InBev. (2018). *Sustainable agriculture*. http://www.ab-inbev.com/better-world/2025-sustainability-goals/agriculture.html

Abbott, K.A., Taylor, M. & Stubbings, L.A. (2012). *Sustainable worm control strategies for sheep: A technical manual for veterinary surgeons & advisers* (4th edition). https://www.scops.org.uk/workspace/pdfs/scops-technical-manual-4th-edition-updated-september-(2013).pdf

ABM (Assured British Meat). 2009. *Sheep tagging and assurance residency.* ABM Newsletter, Spring 2009. https://assurance.redtractor.org.uk/contentfiles/Farmers-5881.pdf?_=635912156751377197

Adger, W. N., Benjaminsen, T. A., Brown, K. & Svarstad, H. (2001). Advancing a political ecology of global environmental discourses. *Development and Change*, 32: 681–715

Agee, J. (2009). Developing qualitative research questions: a reflective process. *International Journal of Qualitative Studies in Education*, 22(4), 431-447

Aglionby, J. (2020). *Exploring the economic, environmental and cultural risks and opportunities to society of changing farm support - a roundtable discussion'* [Video]. Land Management 2.0 webinar series, 5 June 2020. https://www.youtube.com/watch?v=iC9NKRSNe5E

AHDB. (2016). *Ewe fertility for better returns.* (Sheep BRP Manual 11). https://beefandlamb.ahdb.org.uk/wp-content/uploads/2018/04/Ewe-fertility-for-better-returns.pdf

AHDB. (2017). *A Review of Livestock Markets in England.* (Report prepared for the Livestock Auctioneers Association (LAA) by AHDB Beef & Lamb). http://beefandlamb.ahdb.org.uk/wp-content/uploads/2017/05/Livestock-markets-170517.pdf

AHDB. (2018a). *Beef and lamb R&D review 2018/19*. http://beefandlamb.ahdb.org.uk/wp-content/uploads/2018/10/RDReview_1507_180823_WEB-2.pdf

AHDB. (2018b). *Constraints on UK agricultural and horticultural productivity.* https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/ConstraintsUKProd2310_WEB.pdf

AHDB. (2018c). *Planning grazing strategies for Better Returns*. https://projectblue.blob.core.windows.net/media/Default/Imported%20Publication%20Docs/Planning-grazing-strategies-for-better-returns.pdf

AHDB. (2019a). *Iceberg diseases of ewes*: *Technical manual for vets, consultants and farmers*. https://projectblue.blob.core.windows.net/media/Default/Beef%20&%20Lamb/IcebergDiseases2225_190107_WEB.pdf

AHDB. (2019b). *Livestock Information Programme – FAQs*. https://ahdb.org.uk/LIP-faqs

AHDB. (2020a). 'Cattle tags: buying before implementation of Bovine EID'. https://ahdb.org.uk/cattle-tags-buying-before-the-implementation-of-bovine-eid

AHDB. (2020b). *Weekly finished auction markets by region*. Data accessed at https://ahdb.org.uk/beef-lamb/individual-finished-auction-markets

AHDB. (2021). *England abattoir numbers*. https://ahdb.org.uk/pork/england-abattoir-numbers

AHDB. (n.d.). *Monitoring calf health*. http://beefandlamb.ahdb.org.uk/research/animal-health-and-welfare-beef/monitoring-calf-health/

Alison Millward Associates. (2014). Defra PES Pilot Evaluation of the Pumlumon Project. http://randd.defra.gov.uk/Document.aspx?Document=12298_DefraPESpilotEvaluationReportFINAL.PDF

Allen, S. (2017, December 13). *Modern milking parlour designs*. Dairy Discovery Zone blog. https://www.dairydiscoveryzone.com/blog/4-modern-milking-parlor-designs

All-Parliamentary Group on Animal Welfare. (2020). *The future for small abattoirs in the UK: Report on an inquiry into small red meat abattoir provision*. https://apgaw.org/wp-content/uploads/2020/06/the-future-for-small-abattoirs-in-the-uk.pdf

Alston, M., Clarke, J. & Whittenbury, K. (2017). Gender relations, livelihood strategies, water policies & structural adjustment in the Australian dairy industry. *Sociologia Ruralis*, 57 (S1), 752-768

Arai, K. & Morimoto, E. (2016). Construction industry & (dis)economies of scope. In P.W. Chan & C.J. Neilson (Eds.), *Proceedings of the 32nd Annual ARCOM Conference*, 5-7 September 2016, Manchester, UK. Association of Researchers in Construction Management, 1, 279-287.

Arla Foods. (2017). https://www.arlafoods.co.uk/4a3b63/globalassets/about-arla/our-responsibility/standards---updated-from-1-january-(2017).pdf

Arla Foods. (2018, October 16). Arla foods UK unveils new farming standards model to bring sustainable change to dairy farming. [Press release]. https://www.arlafoods.co.uk/overview/news--press/2018/pressrelease/arla-foods-uk-unveils-new-farming-standards-model-to-bring-sustainable-change-to-dairy-farming-2764879/

Arla Foods. (2019). *Arla farmers will use big data to accelerate journey towards carbon net zero*. https://www.arla.com/company/news-and-press/2019/pressrelease/climate-check/

Armstrong, A. (1988). Farmworkers in England and Wales: a social and economic history, 1770-1980. Iowa State University Press

Asfaw, S., Mithoefer, D. & Waibel, H. (2009). Investment in compliance with GlobalGAP standards: does it pay off for small-scale producers in Kenya? *Journal of International Agriculture*, 48(4), 337-362

Atkinson, J. (1984). Manpower strategies for flexible organisations. *Personnel Management*, August, 28-31

References

Aubert, M. (2015). The determinants of selling through a short food supply chains: an application to the French case. *Journées de recherches en sciences sociales (JRSS), Institut National de la Recherche Agronomique (INRA)*. hal-01296422

Bain, C., Ransom, E. & Worosz, M.R. (2011). Constructing credibility: using technoscience to legitimate strategies in agrifood governance. *Journal of Rural Social Sciences*, 25(3), 160-192

Ball, R.M. (1987). Intermittent labour forms in UK agriculture: some implications for rural areas. *Journal of Rural Studies*, 3(2), 133-150

Ball, R.M. (1988). *Seasonality in the UK Labour Market*. Avebury

Banaji, J. (1976). Chayanov, Kautsky and Lenin: considerations towards a synthesis. *Economic and Political Weekly*, 11(4), 1594-1607

Baret, P., Marcq, P., Mayer, C., & Padel, S. (2015). *Research and organic farming in Europe.* (A report commissioned by The Greens and European Free Alliance in the European Parliament).

Barnes, A., Moxey, A., Brocklehurst, S., Barratt, A., McKendrick, I., Innocent, G. & Ahmadi, B. (2020). *Estimating the consequential cost of bovine TB incidents on cattle farmers in the High Risk & Edge Areas of England & High & Intermediate TB Areas of Wales*. (Final report for Defra). http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=19957&FromSearch=Y&Publisher=1&SearchText=se3139&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

Bartolini, F., Vergamini, D., Longhitano, D. & Povellato, A. (2020). Do differential payments for agri-environment schemes affect the environmental benefits? A case study in the North-Eastern Italy. *Land Use Policy*, in press.

Bechhofer, F. & Paterson, L. (2000). *Principles of research design in the social sciences.* Routledge

Bell, D.N. & Blanchflower, D.G. (2013). *How to measure underemployment?* (PIIE Working Paper 13-7). http://library.kiet.re.kr/_MultiData/krms/00038/660/How%20to%20Measure%20Underemployment.pdf

Bellet, N. (2018). Change it or perish? Drug resistance & the dynamics of livestock farm practices. *Journal of Rural Studies*, 63, 57-64

Bernovici, A. (2016, November 24). *Kaufland and WB support Romanian producers to export fruits, vegetables*. The Romania Journal. https://www.romaniajournal.ro/kaufland-and-wb-support-romanian-producers-to-export-fruits-vegetables/

Blanc, M., Cahuzac, E., Elyakime, B. & Tahar, G. (2008). Demand for on-farm permanent hired labour on family holdings, *European Review of Agricultural Economics*, 35(4), 493–518. https://doi.org/10.1093/erae/jbn032

Boatman, N., Jones, N., Garthwaite, D., Bishop, J., Pietravalle, S., Harrington, P. & Parry, H. (Central Science Laboratory). (2007). *Evaluation of the Operation of Environmental Stewardship* (Defra project no. MA01028. Final report). sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=13825

Boncinelli, F., Bartolini, F. & Casini, L. (2018). Structural factors of labour allocation for farm diversification activities. *Land Use Policy*, 71, 204-212

Bord Bia (Irish Food Board). (2010). *Successfully entering the Spanish retail market*. https://www.bordbia.ie/industry/events/SpeakerPresentations/2010/MarketplaceSeminar2010EuropeanGuides/Spain%20Guide.pdf

Boslaugh, S. (2013). *Statistics in a nutshell* (second edition). O'Reilly

Bowen, F., Tang, S. & Panagiotopoulus, P. (2020). A classification of information-based environmental regulation: Voluntariness, compliance & beyond. *Science of the Total Environment*, 712

Bowen, S. (2011). The importance of place: re-territorialising embeddedness. *Sociologia Ruralis*, 51(4), 325-348

Bowler, I., Clark, G., Crockett, A., Ilbery, B. & Shaw, A. (1996). The development of alternative farm enterprises: a study of family labour farms in the northern Pennines of England. *Journal of Rural Studies*, 12(3), 285-295

Bowman, A., Froud, J., Johal, S. and Leaver, A. (2013). Opportunist dealing in the UK pig meat supply chain: trader mentalities and alternatives. *Accounting Forum*, 37(4), 300-314

Bradburn, N., Sudman, S. & Wansink, B. (2004). *Asking questions: the definitive guide to questionnaire design.* Jossey–Bass

Brooks, S., Leaver, A., Spence, M., Elliott, C.T. & Dean, M. (2017). Pragmatic engagement in a low trust supply chain: beef farmers' perceptions of power, trust & agency. *Competition & Change*, 21(2), 114-131

Bryman, A. (2015). *Social research methods* (fifth edition). Oxford University Press

Burton, A.F. (2004). Seeing through the 'good farmer's' eyes: towards developing an understanding of the social symbolic value of 'productivist' behaviour. *Sociologia Ruralis*, 44(2)

Capper, A. (2019). *Labour in horticulture: what are the issues?*. (Presentation at SmartHort 2019 conference, 6–7 March 2019). https://projectblue.blob.core.windows.net/media/Default/Programmes/SmartHort/Articles/Ali%20Capper_Labour%20in%20Horticulture_SmartHort%202019-1.pdf

Carolan, M. (2020). Filtering perceptions of climate change and biotechnology: values and views among Colorado farmers and ranchers. *Climatic Change*, 159(1), 121-139.

Carrefour. (2017). *Environmental management policy.* http://www.carrefour.com/sites/default/files/carrefours_environmental_management_policy_en_2017.pdf

Carrefour. (2018). *Annual Report 2017.* http://www.carrefour.com/sites/default/files/carrefour_-_2017_annual_report.pdf

Case, P. (2018, November 19). *Dairy farmer in TB testing 'vicious cycle'*. Farmers Weekly. https://www.fwi.co.uk/livestock/health-welfare/livestock-diseases/bovine-tb/dairy-farmer-in-tb-testing-vicious-cycle

Centre for Rural Policy Research. (2021). Loneliness, social isolation and mental health in farming communities: An analysis of social and cultural factors. https://socialsciences.exeter.ac.uk/research/centres/crpr/research/projects/project/index.php?id=668

Ceres. (2017). *Digging into sustainable agriculture*. https://www.ceres.org/leading-practices-case-studies/digging-sustainable-agriculture

Charlton, K. & Robinson, P.A. (2019). A qualitative investigation of attitudes & practices of farmers & veterinarians in Wales regarding anthelmintic resistance in cattle. *Veterinaria Italiana*, 55(4), 327-337 https://hau.repository.guildhe.ac.uk/id/eprint/17509/1/Philip%20Robinson%20qualitative%20investigation%20upload.pdf

Chayanov, A.V. (1966 [1925]). Peasant farm organization. In D. Thorner, B. Kerbley & R.E.F. Smith (Eds), *A.V. Chayanov on The Theory of Peasant Economy*. Manchester University Press

CHECS, (2019a). *Incorporating rules for cattle health schemes.* https://checs.co.uk/resources/downloads/

CHECS. (2019b). *Survey of c. 1000 UK cattle health scheme members*. https://checs.co.uk/wp-content/uploads/2020/12/CHeCS-cattle-health-scheme-member-survey-FINAL.pdf

Child, J. (2020). Pasture management for sheep, *Veterinary Practice Today*, 8(1). http://vetpracticetoday.com/vpt-en/catalogs/vpt8-1_sheep/pdf/complete.pdf

Cialdella, N., Dobremez, L. & Madelrieux, S. (2009). Livestock farming systems in urban mountain regions: differentiated paths to remain in time. *Outlook on Agriculture*, 38(2), 127-135

Clark, C. and Scanlon, B. (2019). *Less is more: improving profitability and the natural environment in hill and other marginal farming systems.* Report funded by RSPB, National Trust and the Wildlife Trusts. https://nt.global.ssl.fastly.net/documents/hill-farm-profitability-report-pdf.pdf

Clark, C.C.A., Crump, R., KilBride, A.L. & Green, L.E. (2016). Farm membership of voluntary welfare schemes results in better compliance with animal welfare legislation in Great Britain. *Animal Welfare*, 25 (4). 461-469. https://core.ac.uk/download/pdf/42622575.pdf

Clarke, P. (2020, July 3). *Red Tractor to return to on-farm assessments*. Farmers Weekly.

Clay, N., Garnett, T. & Lorimer, J. (2019). Dairy intensification: drivers, impacts & alternatives. *Ambio*, 49, 35-48.

Coe, N.M., Dicken, P. & Hess, M. (2008). Global production networks: realizing the potential. *Journal of Economic Geography*, 8, 271-295

Condliffe, I. (2009). Policy change in the uplands. In A. Bonn, T. Allott, K., Hubacek & J. Stewart (Eds), *Drivers of Environmental Change in Uplands*. Routledge

Constantini, F, (2020). *Regenerative practices will become critical to deliver new agricultural policy aims*. [LinkedIn]. https://www.linkedin.com/pulse/regenerative-practices-become-critical-deliver-new-aims-costantini/?articleId=6640204726791086080

Co-op. (2020). *Co-op Animal Welfare Standards & Performance & Co-op Antibiotics Policy*. https://assets.ctfassets.net/bffxiku554r1/2l3meYk2jLxPpKWTARwCWR/628e67df6e119d2cd8ae7012578d8ca6/Co-op_Animal_Welfare_Standards__Performance_and_Co-op_Antibiotic_Policy_v4.pdf

Cooper, O. (2014, November 26). *Farmers hit out over changes to Red Tractor scheme*. Farmers Weekly

Corsin, F., Funge-Smith, S., & Clausen, J. (2007). *A qualitative assessment of standards and certification schemes applicable to aquaculture in the Asia–Pacific region.* Asia–Pacific Fishery Commission Food and Agriculture Organization of the United Nations Regional Office for Asia and The Pacific. www.fao.org/docrep/010/ai388e/AI388E00.htm

Cournut, S., Chauvat, S., Correa, P., Carneiro dos Santos Filho, J., Dieguez, F., Hostiou, N., Knanh Pham, D., Serviere, G., Taher Srairi, M., Turlot, A. & Dedieu, B. (2018). Analyzing work organization on livestock farm by the Work Assessment Method. *Agronomy for Sustainable Development*, 38:58

Courtney, P., Gaskell, P., Mills, J., & Edwards, R. (2017). *A socio-economic study of grant-funded traditional drystone wall and farm building restoration in the Yorkshire Dales National Park.* (Report prepared for English Heritage). English Heritage. http://eprints.glos.ac.uk/3995/1/A%20Socio-economic%20study%20of%20grant-funded%20traditional%20drystone%20wall%20and%20farm%20building%20restoration%20in%20the%20Yorkshire%20Dales%20National%20Park.pdf

Courtney, P., Mills, J., Gaskell, P., & Chaplin, S. (2013). Investigating the incidental benefits of Environmental Stewardship schemes in England. *Land use Policy, 31*, 26-37

Coyne, L., Kendall, H., Hansda, R., Reed, M.S. and Williams, D.J.L. (2021). Identifying economic and societal drivers of engagement in agri-environmental schemes for English dairy producers. *Land Use Policy*, 101

Creswell, J.W. & Creswell, J.D. (2017). *Research design: qualitative, quantitative and mixed methods approaches.* Sage

Cullen, B., Amos, D., & Padel, S. (2016). *Description of Farmer Innovation Groups. Deliverable 2.1 for OK-Net Arable research project.* Organic Research Centre. http://orgprints.org/30748/1/OK_NET_WP2_D2%201_final.pdf

Cummins & Leu. (2021). *Regenerative grazing – increased production, biodiversity resilience, profits and a climate change solution*. https://regenerationinternational.org/2021/03/29/regenerative-grazing-increased-production-biodiversity-resilience-profits-and-a-climate-change-solution

Currie, J.I. (2018). *Three centuries of East Herefordshire farms and families*. Owlstone Press

Cush, P. & Macken-Walsh, Á. (2016). Farming through the ages: joint farming ventures in Ireland. *Rural Society*, 25(2), 104-116. DOI: 10.1080/10371656.2016.1194325

Cuttress, D. (2021). *Strategies and technologies to improve farm health and safety.* https://businesswales.gov.wales/farmingconnect/sites/farmingconnect/files/documents/Strategies%20and%20technologies%20to%20improve%20farm%20health%20and%20safety.pdf

Dale, A.J., Laidlaw, A.S., Bailey, J.S. & Mayne, C.S. (2014). Effect of dairy slurry application rate & forage type on production, soil nutrient status & nitrogen-use efficiency. *Grass & Forage Science*, 70, pp.44-58

Darnhofer, I. & Strauss, A. (2014). *Resilience of family farms: understanding the trade-offs linked to diversification*. (Paper presented at the 11th European IFSA Symposium, on "Farming systems facing global challenges: Capacities and strategies", held 1-4 April 2014 in Berlin (Germany)). https://boku.ac.at/fileadmin/data/H03000/H73000/H73300/PJ/rethink/Darnhofer_and_Strauss_IFSA2014.pdf

Darnhofer, I. (2010). Strategies of family farms to strengthen their resilience. *Environmental Policy & Governance*, 20, 212-222

Darnhofer, I. (2012). Socio-technical transitions in farming. In L-A. Sutherland, I. Darnhofer, G.A. Wilson and L. Zagata (Eds). *Transition Pathways towards Sustainability in Agriculture: Case Studies from Europe* (pp. 17-32). CABI

Darnhofer, I. (2021). Farming resilience: from maintaining stages towards shaping transformative change processes. *Sustainability*, 13, 3387

Darnhofer, I., Fairweather, J. & Moller, H. (2010). Assessing a farm's sustainability: insights from resilience thinking. *International Journal of Agricultural Sustainability*, 8(3), 186-198

Darnhofer, I., Lamine, C., Strauss, A. & Navarette, M. (2016). The resilience of family farms: towards a relational perspective. *Journal of Rural Studies*, 44, 111-122

De Vaus, D. (2014). *Surveys in social research* (sixth edition). Routledge

Deakin, S. 2016. Brexit, labour rights and migration: why Wisbech matters to Brussels. *German Law Journal*, 17(S1), 13-21

Dedieu, B. (2009). Qualification of the adaptive capacities of livestock farming systems. *Revista Brasiliera de Zootecnia*, 38, 397-404

Defra. (2004a). *Getting Started in Farm Management Accounting Part I: Using the farm accounts to point the way.* http://adlib.everysite.co.uk/resources/000/015/579/defra_using-accounts1.pdf

Defra. (2004b). *Incorporation of conventional animal welfare assessment techniques into organic certification and farming*. (Final Project Report).

Defra. (2006). *Converting the farm's financial accounts into management accounts: a practical guide. Management accounting for farmers*. http://adlib.everysite.co.uk/resources/000/220/538/farmfinancials.pdf.

Defra. (2011a). *Regional maps of rural areas (Census 2001) – Region: West Midlands*. https://www.gov.uk/government/statistics/regional-maps-maps-of-rural-areas-in-the-west-midlands-region

Defra. (2011b). *Regional maps of rural areas (Census 2001) – Region: South West*. https://www.gov.uk/government/statistics/regional-maps-maps-of-rural-areas-in-the-south-west-region

Defra. (2012). *June Survey of Agriculture & Horticulture: methodology*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/182206/defra-stats-foodfarm-landuselivestock-june-junemethodology-20120126.pdf

Defra. (2013, August). *Farming Regulation Task Force Implementation: Earned Recognition Plan*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/236270/pb14026-earned-recognition-plan-130830.pdf

Defra. (2014). *Identifying and recording sheep and goats: Guidance on the rules for keepers in England*. http://www.arams.co.uk/docs/6-DefraGuidanceDocument-SheepGoats.pdf

Defra. (2018a). *Health & Harmony: the future for food, farming & the environment in a green Brexit. Summary of Responses*. https://www.gov.uk/government/consultations/the-future-for-food-farming-and-the-environment

Defra. (2018b, December). *Farm inspection and regulation review.* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/764286/farm-inspection-regulatio-review-final-report-(2018).pdf

Defra. (2019a). *County / unitary authority*. [Dataset]. Structure of the Agricultural Industry in England & the UK at June. www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

Defra. (2019b). Defra Organic Statistics (2018). www.gov.uk/government/statistics/organic-farming-statistics-2018

Defra. (2019c). Total Income from Farming in the United Kingdom: Second estimate for (2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/860944/agriaccounts-tiffstatsnotice-27jan20.pdf

Defra. (2019d). *Farm type breakdown for commercial holdings*. [Dataset]. Structure of the Agricultural Industry in England and the UK at June. www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

Defra. (2019e.) *Cattle farm practices survey*. https://www.gov.uk/government/statistics/cattle-farm-practices-survey-april-2019

Defra. (2019f). *Countryside Stewardship Mid Tier and Wildlife Offers manual*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/908457/Countryside_Stewardship_Mid_Tier_and_Wildlife_Offers_Manual_2019_v3.0.pdf

Defra. (2019g). *Farm Practices Survey 2018 – England: Farm business practices, soil management and cattle housing*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/792165/fps-general-statsnotice-4apr19.pdf

Defra. (2019h). *Organic farming statistics 2018*. https://www.gov.uk/government/statistics/organic-farming-statistics-2018

Defra. (2020a). *Balance sheet analysis and farming performance, England 2018/(2019).* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/861828/fbs-balancesheetanalysis-30jan20.pdf

Defra. (2020b). The guide to cross compliance in England (2020). https://assets.publishing.service.gov.uk/media/5e05ef55ed915d1f6d7a92dd/Cross_Compliance_2020_rules_v1.0.pdf.

Defra. (2021). *Action for animals: our action plan for animal welfare*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/985332/Action_Plan_for_Animal_Welfare.pdf

Delgado Wise, R. & Veltmeyer, H. (2016). *Agrarian Change, Migration and Development*. Practical Action Publishing

Department for Environment, Food and Rural Affairs. (2017). *The Guide to Cross Compliance in England 2017.* Department for Environment, Food and Rural Affairs. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/579836/Cross_Compliance_2017_rules_FINAL.pdf

Department of Agriculture, Environment and Rural Affairs. (2018). *Guide to the Basic Payment Scheme 2018.* Belfast: Northern Ireland Executive. https://www.daera-ni.gov.uk/sites/default/files/publications/daera/17.18.247d%20BASIC%20PAYMENT%20SCHEME%20GUIDE%202018%20V4.PDF

Devlin, S. (2016). *Agricultural labour in the UK.* Food Research Collaboration. http://foodresearch.org.uk/wp-content/uploads/2016/07/Agricultural-labour-briefing-FINAL-4-July-2016.pdf

Dewick, P. & Foster, C. (2007). Transition in the UK dairy industry: a more sustainable alternative? In S. Lahlou & S. Emmert (Eds). *SCP Cases in the Field of Food, Mobility & Housing* (23-34). (Processings of the workshop of the Sustainable Consumption Research Exchange Network, 3-5 June 2007, Paris, France)

Dillman, D.A. (2000). *Mail and internet surveys* (second edition). John Wiley & Sons.

Dinderleat. (2019, July 12). *Arla* [Online forum post]. The Farming Forum. https://thefarmingforum.co.uk/index.php?threads/arla.141840/page-139

Dirr, A. (2012, July 31). Organic farming: Reduced chemical costs, increased labor. *Aberdeen News*. http://articles.aberdeennews.com/2012-07-31/news/32967117_1_conventional-farmers-organic-crops-organic-food

Djurfeldt, G. (1982). Classical discussions of capital and peasantry. In: J. Harriss (Ed.). *Rural Development: Theories of Peasant Economy & Agrarian Change* (pp. 139-159). Routledge

Donnellan, T. & Hennessy, T. (2012). *The labour allocation decisions of farm households: Defining a theoretical model*. (Factor Markets Working Paper, no. 31). http://aei.pitt.edu/58544/1/Factor_Markets_31.pdf

Dorward, J., & Baldassari, V. (2018, May 27). *Red alert: UK farmers warn of soft fruit shortage*. The Guardian. https://www.theguardian.com/business/2018/may/27/uk-farmers-strawberries-migrant-workers-crisis

Dovecote Park. (2020). *Our farms*. https://www.dovecotepark.com/our-farms

Dovring, F. (1979). Underemployment, slow motion and X-efficiency. *Economic Development & Cultural Change*, 27(3), 485-490

Doyle, C.J. (1990). Application of systems theory to farm planning and control: modelling resource allocation. In J.G.W. Jones and P.R. Street (Eds), *Systems theory applied to agriculture and the food chain* (pp. 89-112). Elsevier

Doyle, L., Brady, A-M. and Byrne, G. (2009). An overview of mixed methods research. *Journal of Research in Nursing,* 14(2), 175-185

ECFR. (2020). *National Organic Program, Organic Production & Handling Requirements*. https://www.ecfr.gov/cgi-bin/text-idx?SID=8825f535997ae06cd92c0e4e2383fe19&mc=true&node=pt7.3.205&rgn=div5

Ecological Land Cooperative. (2012). *Proof of Evidence. APPEAL REFERENCE NUMBERS: APP/Y1138/A/12/2181807, APP/Y1138/A/12/2181808, APP/Y1138/A/12/2181821*. https://ecologicalland.coop/sites/ecologicalland.coop/files/JWProof.pdf

Ecological Land Cooperative. (2013, April). *Inspector says yes!.* Newsletter. https://ecologicalland.coop/sites/ecologicalland.coop/files/ELC_Newsletter_April_(2013).pdf

Edwards, J.W. (1980). Complexity and change in farm production systems: A Somerset case study. *Transactions of the Institute of British Geographers*, 5(1), 45-52

Ehlert, C.R., Mithofer, D. & Waibel, H. (2014). Worker welfare on Kenyan export vegetable farms. *Food Policy*, 46, pp. 66-73.

Elster Jones, J. (2015). *MWT Pumlumon Project: Report from farmer / landowner interviews & discussion group, May-June (2015).* Unpublished report

Elzen, B. Geels, F.W., Leeuwis, C. & van Mierlo, B. (2011). Normative contestation in transitions 'in the making': Animal welfare concerns and system innovation in pig husbandry. *Research Policy*, 40(2), 263-275

English Apples & Pears. (2017). *An assessment of the current and future seasonal labour requirement for UK orchard crop production and the possible implications of restrictions on seasonal worker numbers*. (Prepared by John Pelham of Andersons Midlands on behalf of English Apples & Pears). British Growers Association

Environment, Food and Rural Affairs Committee. (2017). *Feeding the nation: Labour constraints.* (Report to the House of Commons, London). https://publications.parliament.uk/pa/cm201617/cmselect/cmenvfru/1009/1009.pdf

Errington, A. (1988). Disguised unemployment in British agriculture. *Journal of Rural Studies*, 4(1), 1-7. https://doi.org/10.1016/0743-0167(88)90074-5

Errington, A., & Gasson, R. (1994). Labour use in the farm family business. *Sociologia Ruralis*, 34(4), 293-307

Errington, A. & Gasson, R. (1996). The increasing flexibility of the farm horticultural workforce in England & Wales. *Journal of Rural Studies*, 12 (2), 127–14. https://www.sciencedirect.com/science/article/pii/0743016796000083

Escobar, M.P. & Demeritt, D. (2016). Paperwork and the decoupling of audit and animal welfare: The challenges of materiality for better regulation. E*nvironment and Planning C: Politics and Space*, 35(1), 169-190

Euro Quality. (2020). *Quality*. https://euroqualitylambs.co.uk/quality/

European Commission. (2018). *Rural areas & the primary sector in the EU*. https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/farming/documents/eu-rural-areas-primary-sector_en.pdf

Eurostat. (2018). *Agricultural census in the United Kingdom*. http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_census_in_the_United_Kingdom

Evans, N. & Border, P. (2018*). Reducing UK antibiotic use in animals* (POSTNOTE 588). Parliamentary Office of Science & Technology, UK Houses of Parliament

Excel Off The Grid. (2020). Interpolate with Excel. https://exceloffthegrid.com/interpolate-values-using-the-forecast-function/

Farm Animal Welfare Committee. (2016). *Sustainable agriculture and farm animal welfare*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/593479/Advice_about_sustainable_agriculture_and_farm_animal_welfare_-_final_(2016).pdf

Farm Business Survey. (2014). Farm Classification in the United Kingdom. http://farmbusinesssurvey.co.uk/DataBuilder/UK_Farm_Classification_2014_Final.pdf

Farm Business Survey. (Unknown date). UK Farm Classification Document. http://farmbusinesssurvey.co.uk/DataBuilder/defra-stats-foodfarm-farmmanage-fbs-UK_Farm_Classification.pdf

Farmerama. (2017, February 5). *Episode 18: Thoughts from the ORFC, productivity of small-scale farmers, street play and diversity in storytelling, forest fires in Chile, soil life and no-dig insight*. [Podcast]. Farmerama, https://farmerama.co/author/farmerama/page/3/

Farming Advice Services. (2018). *Top tips for compliance with cattle identification and registration.* https://www.nfuonline.com/nfu-online/business/bps/top-tips-for-compliance-with-cattle-identificationfinalv3/

Farming UK. (2019). Cattle health schemes see 30% increase in membership. *Farming UK*, 1 may. https://www.farminguk.com/News/Cattle-health-schemes-see-30-increase-in-membership_51897.html

FarmWeb.co.uk. (2020). *Glossary*. https://www.farmweb.co.uk/tips-advice/glossary/

FAWL. (2018). *Revisions to FAWL standards.* https://fawl.co.uk/images/FAWL/WLBP_Supplement%20ENG.pdf

FBS Data Builder. (2021). Data accessed from http://www.farmbusinesssurvey.co.uk/databuilder/.

Feldman, D.C. (1996). The nature, antecedents and consequences of underemployment. *Journal of Management*, 22(3), 385-407. https://journals.sagepub.com/doi/10.1177/014920639602200302

Ferguson, D.S. (1997). Don't call it 'time and motion study'. *IIE Solutions*, 29(5).

First Milk. (2019). *First Milk launches responsible sourcing programme - First4Milk*. http://www.firstmilk.co.uk/news/2019/first-milk-launches-responsible-sourcing-programme-first4milk/

Flanigan, S., & Sutherland, L.-A. (2015). Buying access to social capital? From collaboration to service provision in an agricultural cooperative. *Sociologia Ruralis, 56*(4), 471-490

Fogerty, M., Soffe, R. & Robbins, K. (2013). *Farm Business Survey 2011/2012: Lowland Grazing Livestock Production in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Fogerty, M., Soffe, R. & Robbins, K. (2014). *Farm Business Survey 2012/13: Lowland Grazing Livestock Production in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Fogerty, M., Soffe, R. & Robbins, K. (2015). *Farm Business Survey 2013/14: Lowland Grazing Livestock Production in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Fogerty, M., Soffe, R. & Robbins, K. (2016). *Farm Business Survey 2014/15: Lowland Grazing Livestock Production in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Fogerty, M., Soffe, R. & Robbins, K. (2017). *Farm Business Survey 2015/16: Lowland Grazing Livestock Production in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Fogerty, M., Soffe, R. & Robbins, K. (2018). *Farm Business Survey 2016-17: Lowland Grazing Livestock Production in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Food Standards Agency. (2019). *Registered dairy establishments, 10 September*. [Dataset]. https://data.gov.uk/dataset/61ce0cbc-3c0e-4311-8021-ff439138eaee/registered-dairy-establishments

Food Standards Agency. (2020). *Chapter 6: Notifiable diseases.* Manual for Official Controls, Amendment 64. https://www.food.gov.uk/sites/default/files/media/document/chapter-6-notifiable-diseases.pdf

Frame, J. & Laidlaw, A.S. (2011). *Improved grassland management* (new edition). Crowood Press

Free Range Dairy. (2020). *Producer standards*. https://freerangedairy.org/producer-standards/

Freeths. (2016). *Grazing licences & farm business tenancies – traps for the unwary landowner*. www.freeths.co.uk/2016/03/04/grazing-licences-and-farm-business-tenancies-traps-for-the-unwary-landowner/

FreshMazovia.com. (2018). *Private standards*. http://freshmazovia.com/en/services/prywatne-standardy/

Friedland, D.S. & Price, R.H. (2003). Underemployment: consequences for the health and well-being of workers. *American Journal of Community Psychology* , 32(1/2), 33-45. https://deepblue.lib.umich.edu/bitstream/handle/2027.42/117095/ajcp471979.pdf?sequence=1&isAllowed=y

FSA (Food Standards Agency). (2019). *Registered dairy establishments as at 1 September 2019*. [Dataset]. https://data.gov.uk/dataset/61ce0cbc-3c0e-4311-8021-ff439138eaee/registered-dairy-establishments

FSA (Food Standards Agency). (2020). *Manual for Official Controls. Chapter 6: Notifiable diseases*. https://www.food.gov.uk/business-guidance/manual-for-official-controls

Gangmasters and Labour Abuse Authority. (2018). *The nature and scale of labour exploitation across all sectors within the United Kingdom: Problem profile.* http://www.gla.gov.uk/media/3537/external-nature-and-scale-of-labour-exploitation-report-final-version-may-2018.pdf

Garcia Martinez, M., Verbruggen, P. & Fearne, A. (2013). Risk-based approaches to food safety regulation: what role for co-regulation? *Journal of Risk Research*, 16(9), 1101-1121

Garnett, T., Godde, C., Muller, A., Roos, E., Smith, P., de Boer, I., zu Ermgassen, E., Herrero, M., van Middelaar, C., Schader, C. & van Zanten, H. (2017). *Grazed & Confused?* Food Climate Research Network

Garry, F.K., Bernie, D.J., Davie, J.C.S. & Pope, E.C.D. (2021). Future climate risk to UK agriculture from compound events. *Climate Risk Management*, 32. https://www.sciencedirect.com/science/article/pii/S2212096321000115

Gaskell, P., Dwyer, J., Jones, J., Jones, N., Boatman, N., Condliffe, I., Conyers, S., Ingram, J., Kirwan, J., Manley, W., Mills, J. and Ramwell, C. (2010). *Economic and environmental impacts of changes in support measures for the English Uplands: An in-depth forward look from the farmer's perspective.* (Final report to the Defra Agricultural Change and Environment Observatory programme by the Countryside and C). http://eprints.glos.ac.uk/2731/

Gasson, R. (1979). *Labour sharing in agriculture*. (Report prepared for the Agricultural Training Board, Central Council for Agricultural & Horticultural Cooperation, & the National Farmers' Union Development Trust). Wye College.

Gasson, R. (1992). Farmers' wives – their contribution to the farm business. *Journal of Agricultural Economics*, 43(1), 74-87

Gasson, R. & Winter, M. (1992). Gender relations and farm household pluriactivity. *Journal of Rural Studies*, 8(4), 387-397

Gillham, B. (2000). *Developing a questionnaire*. Continuum.

GIZ. (2011). *Integrating smallholders into global supply chains*. (GLOBALGAP Option 2 Smallholder Group Certification Generic Manual: Lessons learnt in pilot projects in Kenya, Ghana, Thailand and Macedonia). https://www.giz.de/expertise/downloads/giz2010-en-smallholder-supply-chains.pdf

Global Food Safety Initiative. (2018). *What is GFSI*. https://www.mygfsi.com/about-us/about-gfsi/what-is-gfsi.html

Goodman, D. (2004). Rural Europe redux? Reflections on alternative agro-food networks and paradigm change. *Sociologia Ruralis*, 44(1), 3-16

Gosnell, H., Gill, N. & Voyer, M. (2019). Transformational adaptation on the farm: processes of change and persistence in transitions to 'climate-smart' regenerative agriculture. *Global Environmental Change*, 59

GOV.UK. (2013). *Hill farming: grants and requirements for upland farmers* . Food and farming: https://www.gov.uk/guidance/hill-farming

GOV.UK. (2014a). *Cross compliance: 2013 inspection results*. [Web page and dataset]. https://www.gov.uk/government/publications/cross-compliance-2013-inspection-results

GOV.UK. (2014b). *Changes to farm typology: use of 2010 standard output coefficients and updated standard labour coefficients*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/365563/fbs-effectsofstandardoutputcoefficients-21oct14.pdf

GOV.UK. (2016). *Farm Business Survey – statistical information*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/557607/fbs-statisticalinformation-4oct16.pdf

GOV.UK. (2018a). *Health & Harmony: the future for food, farming & the environment in a Green Brexit. Summary of responses*. www.gov.uk/government/publications

GOV.UK. (2018b). *Facilitation fund: Countryside Stewardship.* https://www.gov.uk/government/collections/countryside-stewardship-facilitation-funding

GOV.UK. (2019a). *Commons eligibility checks*. https://www.gov.uk/government/publications/commons-eligibility-checks

GOV.UK. (2019b). *Handling of manure & slurry to reduce antibiotic resistance*. https://www.gov.uk/guidance/handling-of-manure-and-slurry-to-reduce-antibiotic-resistance

GOV.UK. (2019c). *Guide to Cross Compliance in England (2020)*. https://www.gov.uk/guidance/guide-to-cross-compliance-in-england-2020

GOV.UK. (2020a). *Cattle identity registration*. https://www.gov.uk/topic/keeping-farmed-animals/cattle-identity-registration

GOV.UK. (2020b). *Bovine TB: get your cattle tested in England*. https://www.gov.uk/guidance/bovine-tb-getting-your-cattle-tested-in-england

GOV.UK. (2021). *Countyside Stewardship grants*. www.gov.uk/countryside-stewardship-grants

Grando, S., Brunori, G., Knickel, K., Pinot-Correia, T. & Sutherland, L-A. (2016). *Initial conceptual framework*. (Deliverable 1.1, Work Package 1, SALSA research project). http://www.salsa.uevora.pt/en/salsa-reportspublications/

Greenfield, H. & Carman, T. (2017). *Small scale farming and land access: Micro-dairies in the UK*. (Report by Real Farming Trust.) https://www.accesstoland.eu/IMG/pdf/uk_small_scale_farming_-_microdairies.pdf

Greenhalgh, I.J. (2010). *The role of the rural contractor in flexible labour use on South Island sheep and beef farms*. Master's thesis, Lincoln University. https://researcharchive.lincoln.ac.nz/bitstream/handle/10182/3447/greenhalgh_mapplsc.pdf;sequence=3

Greenstreet Berman. (2013). *Assessment and comparison of third party assurance schemes in the food sector: towards a common framework.* Food Standards Agency. https://www.food.gov.uk/sites/default/files/media/document/835-1-1534_GSB_CR2435_3rd_Party_Assurance_Scheme_R2_V8_FCA.pdf

Groves, R.M., Fowler Jr, F.J., Couper, M.P., Lepkowski, J.M., Singer, E. & Tourangeau, R. (2009). *Survey methodology* (second edition). John Wiley & Sons.

Halleron, R. (2017, April 2). *M&S adopts RSPCA quality assurance standards for dairy*. Agriland. http://www.agriland.ie/farming-news/ms-adopts-rspca-quality-assurance-standards-for-dairy/

Happycows. (2019, July 11). *Arla* [Online forum post]. The Farming Forum. https://thefarmingforum.co.uk/index.php?threads/arla.141840/page-138

Harrison, J.L. & Getz, C. (2015). Farm size & job quality: mixed-methods studies of hired farmwork in California & Wisconsin. *Agriculture & Human Values*, 32, 617-634

Harrison-Mayfield, L., Dwyer, J., & Brookes, G. (1998). The socio-economic effects of the Countryside Stewardship scheme. *Journal of Agricultural Economics, 49*(2), 157-170

Harvey, D. & Scott, C. (2015). *Farm Business Survey 2013/14: Hill Farming in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Harvey, D. (2010). *A Companion to Marx's Capital: Volume 1.* Verso

Hayden, M.T., Mattimoe, R. & Jack, L. (2021). Sensemaking and the influencing factors on farmer decision-making. *Journal of Rural Studies*, 84, 31-44

Henderson, E. (2020, January 30). *NFU seeks solution to bull calf euthanasia*. Farmers Weekly. https://www.fwi.co.uk/livestock/dairy/nfu-seeks-solution-to-bull-calf-euthanasia

Henson, S., & Humphrey, J. (2010). Understanding the complexities of private standards as in global agri-food chains as they impact developing countries. *Journal of Development Studies, 46*(9), 1628-1646

Heritage Graziers. (2019). *Our livestock.* http://www.heritagegraziers.co.uk/our-livestock

Herzfeld, T. & Jongeneel. (2008). *Economics of compliance: a review of theories and an application to agriculture*. (Paper presented at IAMO Forum, 2008). https://www.researchgate.net/profile/Thomas_Herzfeld/publication/37790937_Economics_of_compliance_a_review_of_theories_and_an_application_to_agriculture/links/0fcfd50ea730e4502c000000/Economics-of-compliance-a-review-of-theories-and-an-application-to-agriculture.pdf

Hess, M. (2004). 'Spatial relationships? Towards a reconceptualization of embeddedness'. *Progress in Human Geography*, 28(2), 165-186

Higham, L. (2019). *FAI presents a 3Rs approach to antimicrobial stewardship in livestock supply chains*. http://www.faifarms.com/portfolio-item/fai-presents-a-3rs-approach-to-antimicrobial-stewardship-in-livestock-supply-chains/

Hill, C., (2020, May 1). *'Carbon farming' trial will explore how farms can reduce climate impact*. Eastern Daily Press. https://www.edp24.co.uk/news/business/brown-and-co-and-defra-launch-elms-test-and-trial-1535860

Hinton, P. R. (2014). *Statistics Explained*. Third edition. Hove, East Sussex: Routledge

Hobbs, J.E. (1995). Evolving marketing channels for beef and lamb in the United Kingdom: a transaction cost approach. *Journal of International Food and Agribusiness Marketing*, 7(4), 15-39

Hobbs, J.E., Fearne, A. & Spriggs, J. (2002). Incentive structures for food safety & quality assurance: an international comparison. *Food Control*, 13, 77-81

Holzapfel, S. & Wollni, M. (2014). Is GlobalGAP certification of small-scale farmers sustainable? Evidence from Thailand. *Journal of Development Studies*, 50:5, 731-747

Horn, M., Zollitsch, W., Baldinger, L., Ferris, C., Sairanen, A. & Measures, M. (2016). *Suitable genotypes for low-input and organic dairy systems.* (A SOLID project e-learning tool). https://farmadvice.solidairy.eu/solid-e-learning/

Hostiou, N. (2013). Work flexibility of organic suckler sheep farms in France. *Organic Agriculture*, 3, 111-121

Hostiou, N. & Dedieu, B. (2011). A method for assessing work productivity & flexibility in livestock farms. *Animal*, pp. 1-11. doi:10.1017/S1751731111002084.

Hostiou, N., Vollet, D., Benoit, M. & Delfosse, C. (2020). Employment & farmers' work in European ruminant livestock farms: a review. *Journal of Rural Studies*, 74, 223-234

House of Commons. (2011). *Farming in the Uplands. Third report of session 2010-11.* (Volume I: Report, together with formal minutes, oral & written evidence). The Stationery Office. http://www.cumbriacommoners.org.uk/files/efra_farming_in_the_uplands.pdf

Houses of Parliament. (2019). *Climate change and agriculture*. Postnote no. 600, May 2019. https://data.gov.uk/dataset/61ce0cbc-3c0e-4311-8021-ff439138eaee/registered-dairy-establishments

Huber, R., Flury, C. & Finger, R. (2015). Factors affecting farm growth intentions of family farms in mountain regions: Empirical evidence for Central Switzerland. *Land Use Policy*, 47, 188-197

Hughes, A.S. (2016). Mixed methods research. https://www.psychologicalscience.org/observer/mixed-methods-research

Humphrey, J., McCulloch, N. & Masako, O. (2004). The impact of European market changes on employment in the Kenyan horticulture sector. Journal of International Development, 16, 63-80

Hurley, P., Rose, D.C., Shortland, F., Little, R., Lobley, M., Nye, C., Hurley, P., Hall, J. and Schillings, J. (2022) *Farmers' mental health and the COVID-19 pandemic.* Policy Into Practice 1, January 2022. https://research.reading.ac.uk/landscapes-of-support/wp-content/uploads/sites/204/2022/01/Brief.pdf

Hybu Cig Cymru [Meat Promotion Wales]. (2014). Beef Finishing Systems: Options for Beef Farms in Wales. https://meatpromotion.wales/images/resources/Beef_finishing_systems_.pdf

Hybu Cig Cymru. (2021, 23 May). *Impact of potential New Zealand and Australia trade deals on Welsh farming analysed by MPs*. https://meatpromotion.wales/en/news-industry-info/impact-of-potential-new-zealand-and-australia-trade-deals-on-welsh-farming-analysed-by-mps

IFAD. (2016). Rural development report 2016: Fostering inclusive rural transformation. www.ifad.org/pub/rdr

IFLS/CCRI. (2016). *Case study reports: Steps 1-2*. (PEGASUS project, deliverable D4.1). http://pegasus.ieep.eu/resources-list

Ilbery, R. & Maye, D. (2005). Alternative (shorter) food supply chains and specialist livestock products in the Scottish-England borders. *Environment and Planning A*, 37, 823-844

Ingram, J. (2010). Technical and social dimensions of farmer learning: an analysis of the emergence of reduced tillage systems in England. *Journal of Sustainable Agriculture, 34*(2), 182-201. http://www.ccri.ac.uk/wp-content/uploads/2013/04/Reduced-tilage-systems-in-England.pdf

Ingram, J., Maye, D., Kirwan, J., Curry, N.R. & Kubinakova, K. (2015) Interactions between niche and regime: An analysis of learning and innovation networks for sustainable agriculture across Europe. *Journal of Agricultural Education and Extension*, 21(1), 55-71

Ingram, J., & Mills, J. (2014). *Overview of socio-economic influences on crop and soil management systems.* (Deliverable 5.2 of SmartSOIL collaborative project). http://smartsoil.eu/fileadmin/www.smartsoil.eu/WP5/D5_2_Final.pdf

Ingram, J., Mills, J., Frelih-Larsen, A., & Davis, M. (2012). *Uptake of soil management practices and experiences with decision support tools: Analysis of the consultation with the farming community.* CCRI. http://smartsoil.eu/fileadmin/www.smartsoil.eu/WP5/D5_1_Final.pdf

Ingram, J., Short, C., Gaskell, P., Mills, J., Lewis, N., Clark, M., Dennis, E., Fisher, R. & Owen, I. (2009). *Entry and exit from agri-environmental schemes in Wales*. (Final Report Prepared for Welsh Assembly Government). CCRI. https://core.ac.uk/download/pdf/76979483.pdf

Initiative, G. F. (2017). *Preparing Your GFSI Roadmap.* https://www.mygfsi.com/files/Information_Kit/Fact_Sheets/4_GFSI_Roadmap_NAmerica_2017.pdf

Irvine, A. (2011). Duration, dominance & depth in telephone and face-to-face interviews: a comparative exploration. *International Journal of Qualitative Methods*, 10(3), 202-220

Irvine, A., Drew, P. & Sainsbury, R. (2012). 'Am I not answering your questions properly?' Clarification, adequacy and responsiveness in semi-structured telephone and face-to-face interviews. *Qualitative Research*, 13(1), 87-106

Jack, C.G., Moss, J.E. & Wallace, M.T. (2009). *Waiting for Godot: restructuring on small family farms*. (Paper presented at EAAE-IAAE Seminar, 26-27 June 2009, Canterbury). https://ideas.repec.org/p/ags/eaa111/52835.html

James, D. (2019, May 20). *How a Welsh dairy has slashed its antibiotics use*. Farmers Weekly

Johnston, W. & Sandrey, R. (1990). Land markets & rural debt. In R. Sandrey & R. Reynolds (Eds), *Farming without subsidies: New Zealand's recent experience* (pp. 183-209). Wright & Carman

Jones, K. (2020, July 17). *The future for animal health and welfare*. Farmers Guardian.

Jones, L. (2014). *The role of lamb producer groups in the New Zealand Industry*. Kellogg Rural Leadership Programme. http://researcharchive.lincoln.ac.nz/bitstream/handle/10182/6695/Jones_2014.pdf?sequence=1&isAllowed=y

Kasimis, C. & Papadopoulos, A.G. (2005). The multifunctional role of migrants in the Greek countryside: implications for the rural economy and society. *Journal of Ethnic and Migration Studies*, 31(1), 99-127

Keogh, S. (2014). *The allocation of time to non-market off-farm activities by farm household members in the west of Ireland*. (Doctoral dissertation, National University of Ireland).

Kerr, C. (2019). *Responsible medicine use: managing parasites and preventing resistance*. http://www.faifarms.com/portfolio-item/responsible-medicine-use-managing-parasites-and-preventing-resistance/

Kirezieva, K., Bijman, J., Jacxsens, L. and Luning, P.A. (2016). The role of cooperative in food safety management of fresh produce chains: Case studies in four strawberry cooperatives. *Food Control*, 62 299-308

Kirwan, S. (2010). *Best uses of labour for animal welfare and productivity in extensive sheep farming systems in Britain.* (Doctoral dissertation, University of Aberdeen). https://digitool.abdn.ac.uk/webclient/StreamGate?folder_id=0&dvs=1555168417363~206

Kirwans. (2018, May). *Bureaucracy key factor in farmers' mental health issues, solicitor claims*. https://www.kirwanssolicitors.co.uk/press/2018/may/bureaucracy-key-factor-in-farmers%E2%80%99-mental-health-issues-solicitor-claims/

Kloss, M. (2017). *Factor productivity in EU agriculture: A microeconometric perspective*. (Studies on the Agricultural & Food Sector in Transition Economies, No. 89). Leibniz

Koç, A.A., Serhat, A., Hami, A. & Handan, G.F. (2011). *Food quality assurance schemes in Turkey*. (JRC Scientific and Technical Reports). European Union. https://pdfs.semanticscholar.org/1642/f85e1be661a27c03e0a6e26a0b765a745f53.pdf

Koops, W., Ekström, J. and Armstrong, D. (2018). *Report on practical strategies to reduce antimicrobial use in dairy farming* (EuroDairy report). https://static-lantbruksforskning.s3.amazonaws.com/uploads/attachments/5_8_REPORT_practical_strategies_to_reduce_antimicrobials_draft_2018_11.pdf

KPMG. (2013). *Improving Smallholder Livelihoods: Effectiveness of Certification in Coffee, Cocoa & Cotton*. Study commissioned by SUSTAINEO. https://www.standardsimpacts.org/sites/default/files/KPMG_SUSTAINEO_Improving_smallholder_livelihoods_Effectiveness_of_certification.pdf

Kuhmonen, I. (2020). The resilience of Finnish farms: exploring the interplay between agency and structure. *Journal of Rural Studies*, 80, 360-371

Lamanthe, A. & Rau, V. (2014). Fruit production in France and Argentina: globalizing standards and labour markets. In J. Gertel and S.R. Sippel (Eds), *Seasonal Workers in Mediterranean Agriculture*. Routledge

Lampkin, N., Gerrard, C., & Moakes, S. (2014). *Long term trends in the financial performance of organic farms, England and Wales, 2006/7-2011/12.* Organic Research Centre. http://orgprints.org/26339/1/Long%20term%20trends%20in%20organic%20farming%20income_ORC.pdf

Land Management 2.0. (2020). *Remote Assurance: Striking the Right Balance - A Roundtable Discussion 24th June*. Land Management 2.0 webinar. https://landmanagement20.com/roundtables/remote-assurance-schemes or https://www.youtube.com/watch?v=tkyIwFzhr1w

Landworkers' Alliance. (2018). *Health & Harmony responses from the Landworkers' Alliance*. https://landworkersalliance.org.uk/wp-content/uploads/2018/10/handhresponse.pdf

Langton, S. (2014). *Contracting on English farms: evidence from existing surveys.* Defra Agricultural Change and Environmental Observatory Research Report No. 35. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/370275/agrianalysis-contracting-04nov14.pdf

Lasta-Bravo, X. B., Hubbard, C., Garrod, G., & Tolon-Becerra, A. (2015). What drivers farmers' participation in EU agri-environmental schemes? Results from a qualitative meta-analysis. *Environmental Science & Policy, 54*, 1-9

Laughton, R. (2017). *A matter of scale: a study of the productivity, financial viability & multifunctional benefits of small farms (20 ha and less).* Landworkers' Alliance & Centre for Agroecology, Water & Resilience. https://landworkersalliance.org.uk/2017/07/small-scale-agroecological-farms-attract-uk-workers-produce-high-yields-of-vegetables-and-deliver-multiple-environmental-and-social-benefits/

Leach, M. & Tadros, L. (2014). Epidemics and the politics of knowledge: contested narratives in Egypt's H1N1 response. *Medical Anthropology*, 33:3, 240-254

LEAF. (2020). *LEAF Marque Standard v15.0: What has changed?* https://s3-eu-west-1.amazonaws.com/leaf-website/LEAF-Marque-Standard-V15-What-has-changed-FINAL.pdf

Leavy, P. (2017). *Research design*. The Guilford Press.

Lechuga, V.M. (2012). Exploring culture from a distance: the utility of telephone interviews in qualitative research. *International Journal of Qualitative Studies in Education*, 25(3)

Leibenstein, H. (1957). The theory of underemployment in backward economies. *Journal of Political Economy*, 65(2), 91-103

Lewis, K.A., Green, A., Tzilivakis, J. & Warner, D.J. (2011). The contribution of UK farm assurance schemes towards desirable environmental policy outcomes. *International Journal of Agricultural Sustainability*, 8(4)

Li, L. & Tonts, M. (2016). The impacts of temporary labour migration on farming systems of the loess plateau, Gansu Province, China. *Population, Space and Place*, 20, 316-332

Lima, E., Hopkins, T., Gurney, E., Shortall, O., Lovatt, F., Davies, P., et al. (2018). Drivers for precision livestock technology adoption: A study of factors associated with adoption of electronic identification technology by commercial sheep farmers in England & Wales. *PLoS ONE*, 13(1): e0190489

Llywodraeth Cymru. (2018). *Powys Health Board profile*. https://gov.wales/sites/default/files/statistics-and-research/2018-12/160622-workforce-welsh-language-support-primary-care-powys-en.pdf

Lobley, M. & Potter, C. (2004). Agricultural change and restructuring: recent evidence from a survey of agricultural households in England. *Journal of Rural Studies*, 20(4), 499-510

Lobley, M., Reed, M. & Butler, A. (2006). *The impact of organic farming on the rural economy in England*. (Final Report to DEFRA. CRR Research Report No. 11). http://orgprints.org/10114/2/Impacts_of_organic_farming_on_the_rural_economy_RE0117.pdf

Loughrey, J. & Hennessy, T. (2014). Hidden underemployment among Irish farm holders, 2002-2011. *Applied Economics*. http://dx.doi.org/10.1080/00036846.2014.925077

Macauley Land Use Research Institute. (2000). *Socio-economic and agricultural impacts of the Environmentally Sensitive Areas (ESA) scheme in Scotland*. (A report for the Scottish Executive Rural Affairs Department. Coordinating author: Bob Crabtree. Economics & Policy Series No. 6). Macauley Land Use Research Institute

MacDonald, D., Crabtree, J.R., Wiesinger, G., Dax, T., Stamou, N., Fleury, P., Gutierrez Lazpita, J. & Gibon, A. (2000). Agricultural abandonment in mountain areas of Europe: Environmental consequences & policy response. *Journal of Environmental Management*, 59(1), 47-69

Madelrieux, S., Dedieu, B., Dobremez, L. & Girard, N. (2009). Patterns of work organisation in livestock farms: the Atelage approach. *Livestock Science*, 121, 28-37

Madelrieux, S., Terrier, M., Borg, D. & Dobremez, L. (2015). Family dairy farms in the northern french alps: Persistence and adaptation in a changing world. *Mountain Research and Development*, 35(1), 49-56

MAGIC. (2019). Magic Map displaying layers for Disadvantages & Severely Disadvantaged Less Favoured Areas under 'Land-based designations'. https://magic.defra.gov.uk/MagicMap.aspx

Malanski, P.D., Ingrand, S. & Hostiou, N. (2019). A new framework to analyze changes in work organization for permanent employees on livestock farms. *Agronomy for Sustainable Development.* 39, 12. https://doi.org/10.1007/s13593-019-0557-3

Mansfield, L. (2008). The Cumbria Hill Sheep initiative: a solution to the decline in upland hill farming community in England? In G.M. Robinson (Ed), *Sustainable Rural Systems: Sustainable Agriculture and Rural Communities* (pp. 161-183). Routledge

Mansfield, L. & Peck, F. (2013). Applying Fair Trade to British upland agriculture. *Outlook on Agriculture*, 42/3, 29-50

Mantino, F. (2017). Employment effects of the CAP in Italian agriculture: territorial diversity and policy effectiveness. *EuroChoices, 16*(3), 12-17

Marks and Spencer. (2018). *Plan A*. https://corporate.marksandspencer.com/plan-a

Marsh, J. (2017, June 5). *Managing pasture for sheep*. Vet Times. https://www.vettimes.co.uk/app/uploads/wp-post-to-pdf-enhanced-cache/1/managing-pasture-for-sheep.pdf

Marx, K. (1867) [1990]. *Capital Volume I.* Penguin Classics.

Marzek, M. (2006). *Do countries of Central and Eastern Europe need EurepGap? Retailers point of view*. (PowerPoint slides). Metro Group. http://www2.globalgap.org/documents/webdocs/3-1_Marek_Eastern_Europe_need_EurepGap.pdf

Maye, D. K., J.; Vigani, M.; Bundhoo, D.; Chiswell, H (2018a). UK National Report (SUFISA). Cheltenham, Countryside and Community Research Institute, University of Gloucestershire.

Maye, D., Kirwan, J., Vigani, M., Bundhoo, R. & Chiswell, H. (2018b). *Sufisa - Dairy Report: An extended summary*. (September 2018). https://www.sufisa.eu/wp-content/uploads/2018/09/D__2.2-UK-National-Report.pdf

McHoul, H., Robertson, P. & Wilson, P. (2013). *Farm Business Survey 2011/12: Dairy Farming in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/.

McHoul, H., Robertson, P. & Wilson, P. (2014). *Farm Business Survey 2012/13: Dairy Farming in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/.

McHoul, H., Robertson, P., Smith, D. & Wilson, P. (2015). *Farm Business Survey 2013/14: Dairy Farming in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/.

McHoul, H., Robertson, P., Smith, D. & Wilson, P. (2016). *Farm Business Survey 2014/15: Dairy Farming in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/.

McHoul, H., Smith, D., Robertson, P. & Wilson, P. (2017). *Farm Business Survey 2015/16: Dairy Farming in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/.

McNally, S. (2001). Farm diversification in England & Wales – what can we learn from the farm business survey? *Journal of Rural Studies*, 17(2), 247-257

Medium.com. (2018). *An overview of correlation measures between categorical and continuous variables*. https://medium.com/@outside2SDs/an-overview-of-correlation-measures-between-categorical-and-continuous-variables-4c7f85610365

Meraner, M., Heijman, W., Kuhlman, T. & Finger, R. (2015). Determinants of farm diversification in the Netherlands. *Land Use Policy*, 42, 767-780

Meredith, A. (2019). Muller to incentivise ending bull calf euthanasia. *Farmers Weekly*, 3 December. https://www.fwi.co.uk/business/markets-and-trends/dairy-markets/muller-to-incentivise-ending-bull-calf-euthanasia

Merriam, S.B. (2009). *Qualitative Research : A Guide to Design and Implementation*. Jossey-Bass

Mettepenningen, E, Verspecht, A. & Van Huylenbroeck, G. (2009). Measuring private transaction costs of European agri-environmental schemes*. Journal of Environmental Planning and Management*, 52:5, 649-667

Midgley, O. (2018, September 14). Red Tractor in 'one-stop assurance bid'. . *Farmers Guardian*.

Midmore, P., Langstaff, L., Lowman, S., & Vaughan, A. (2008). Evaluating Pillar 2 employment impacts: case study methodology and results for East Wales. *12th Congress of the European Association of Agricultural Economists.*

Migration Advisory Committee. (2018). *EEA Migation in the UK: Final Report.* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/741926/Final_EEA_report.PDF

Milestad, R., Dedieu, B., Darnhofer, I. & Bellon, B. (2012). Farms and farmers facing change: the adaptive approach. In I. Darnhofer, D. Gibbon, B. Dedieu (Eds). *Farming systems research into the 21st century: The new dynamic* (pp.367-388). Springer

Mills, J. (2012). Exploring the social benefits of agri-environment schemes in England. *Journal of Rural Studies, 28*(4), 612-621

Mills, J., Gaskell, P., Ingram, J., & Chaplin, S. (2018). Understanding farmers' motivations for providing unsubsidised environmental benefits. *Land Use Policy, 76*, 697-707

Mills, J., Lewis, N. and Dwyer, J. (2010). *The benefits of LEAF membership : a qualitative study to understand the added value that LEAF brings to its farmer members*. (Final report, prepared for LEAF). https://archive.leafuk.org/eblock/services/resources.ashx/000/563/370/The_Benefits_of_LEAF_Membership.pdf

Minten, B., Dereje, M., Engida, E. & Tamru, S. (2017). Tracking the quality premium of certified coffee: evidence from Ethiopia. *World Development*, 101, 119-132

Moor Meadows. (2019). *Contractors*. https://moormeadows.org.uk/information/resources/contractors/

Morison, J., Hine, R., & Pretty, J. (2005). Survey and analysis of labour organic farms in the UK and Republic of Ireland. *International Journal of Agricultural Sustainability, 3*(1), 24-43

Morley, C. (2019, July 8). *Spotlight on Rob Smith*. University of Liverpool Inside Science newsletter. https://www.liverpool.ac.uk/technology-directorate/inside-life-science/spotlight/rob-smith/

Morris, C. & Buller, H. (2003). The local food sector: a preliminary assessment of its form and impact in Gloucestershire. *British Food Journal*, 105(8), 559-556

Morris, C. & Kirwan, J. (2011). Exploring the ecological dimensions of producer strategies in alternative food networks in the UK. *Sociologia Ruralis*, 51(4), 349-369

Morris, W., Henley, A. & Dowell, D. (2017a). Farm diversification, entrepreneurship and technology adoption: Analysis of upland farmers in Wales. *Journal of Rural Studies*, 53, 132-143

Morris, C., Jarrett, J., Lobley, M. & Wheeler, R. (2017b). *Baseline farm survey – final report*. (Report for Defra project LM0302 Sustainable Intensification Research Platform Project 2: Opportunities & Risks for Farming & the Environment at Landscape Scales). http://randd.defra.gov.uk/Document.aspx?Document=14149_SIP2_WP2.2A_T2_FinalReport_BaselineFarmSurvey_Mar2017.pdf

Morrisons. (2020). *Farm animal health and welfare report*: *2019/20*. https://www.morrisons-farming.com/globalassets/farming/documents/fahw-report-2019_20_final.pdf

Muirhead, J. (2015). *'Indirect' land grabbing, private certification and Global GAP*. (Paper to be presented at the 'ECPR General Conference 2015', 26-29 August 2015). https://ecpr.eu/Filestore/PaperProposal/f61202be-b12f-4977-a9e8-5853202b8521.pdf

Mukhamedova, N. & Wegerich, K. (2018). The feminization of agriculture in post-Soviet Tajikistan. *Journal of Rural Studies*, 57, 128-139

Mundler, P., & Jean-Gagnon, J. (2020). Short food supply chains, labor productivity and fair earnings: An impossible equation? *Renewable Agriculture and Food Systems*, 35(6), 697-709

Muñoz-Ulecia, E., Bernués, A., Casasús, I., Olaizola, A.M., Lobón, S. & Martín-Collado, D. (2021). Drivers of change in mountain agriculture: A thirty-year analysis of trajectories of evolution of cattle farming systems in the Spanish Pyrenees. *Agricultural Systems*, 186, 102983

Muto, P. (2021). *How well is the legume and herb-rich ley option implemented under environmental stewardship?* (Presentation at British Grassland Society's 13th research conference, 3 March 2021).

Nadis. (2012). *Lameness control in sheep*. https://www.nadis.org.uk/disease-a-z/sheep/lameness-control-in-sheep/

National Association of Agricultural Contractors. (2018). *Submission to Migration Advisory Committee*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692718/Agriculture__forestry_and_fishing_tl_-_responses.pdf

Nettle, R., Kuehne, G., Lee, K. & Armstrong, D. (2018). A new framework to analyse workforce contribution to Australian cotton farm adaptability. *Agronomy for Sustainable Development*, 38. DOI: https://doi.org/10.1007/s13593-018-0514-6

Newby, H. (1978). The rural sociology of advanced capitalist societies. In H. Newby, *International Perspectives in Rural Sociology* (3-30). John Wiley & Sons

Newton, P., Civita, N., Frankel-Goldwater, L., Bartel, K. & Johns, C. (2020). What is regenerative agriculture? A review of scholar and practitioner definitions based on processes & outcomes. *Frontiers in Sustainable Food Systems*, 26 October. https://www.frontiersin.org/articles/10.3389/fsufs.(2020).577723/full?&utm_source=Email_to_rerev_&utm_medium=Email&utm_content=T1_11.5e4_reviewer&utm_campaign=Email_publication&journalName=Frontiers_in_Sustainable_Food_Systems&id=577723

NFU & NFU Cymru. (2019). *A manifesto for the uplands.* (All Party Parliamentary Group for Hill Farming). https://www.nfuonline.com/nfu-online/sectors/hill-farming/appg-report-v02-uplands-farming-v2/

NFU. (2020a). *Livestock Information Programme update*. https://www.nfuonline.com/nfu-online/sectors/livestock/livestock-information-service/

NFU. (2020b). 'NFU members set to start net zero ELMs Test & Trial'. https://www.nfuonline.com/cross-sector/environment/net-zero/net-zero-news/nfu-members-set-to-start-net-zero-elms-test-and-trial/

NFU. (n.d.). *Great British beef week*. https://www.nfuonline.com/great-british-beef-week-sucklers-2/

Nicholas, P.K.; Mandolesi, S.; Naspetti, S. & R. Zanoli. (2014). Innovations in low input & organic dairy supply chains – What is acceptable in Europe? *Journal of Dairy Science*, 97, 1157-1167

Noe, E., & et al. (2015). Knowledge asymmetries between research and practice: a social systems approach to implementation barriers in organic arable farming. *Sociologia Ruralis, 55*(4), 460-482.

Nomis. (2020). *Local authority profiles*. (Official labour market statistics). https://www.nomisweb.co.uk/reports/lmp/la/contents.aspx

Northern Upland Chain Local Nature Partnership. (2016). *High Nature Value Farming in the Northern Upland Chain*. http://www.nuclnp.org.uk/wp-content/uploads/2016/01/High_Nature_Value_farming_in_the_Northern_Upland_Chain_(2015).pdf

Nowak, B., Nesme, T., David, C., & Pellerin, S. (2015). Nutrient recycling in organic farming is related todiversity in farm types at the local level. *Agriculture, Ecosystems & Environment*, 204, 17-26

NSA [National Sheep Association]. (2020, November 16). *Better understanding of UK sheep farming urgently needed by Secretary of State, says NSA*. National Sheep Association. https://www.nationalsheep.org.uk/news/30337/better-understanding-of-uk-sheep-farming-urgently-needed-by-secretary-of-state-says-nsa/

Nye, C. (2017). *Forgotten farmworkers: contemporary farm labour and sustainability in the South West of England*. Doctoral dissertation, University of Exeter. https://ore.exeter.ac.uk/repository/handle/10871/33119

Nye, C. (2018). The 'blind spot' of agricultural research: labour flexibility, composition and worker availability in the South West of England. *Cahiers Agricultures,* 27(3), 1-7

Nye, C. and Lobley, M. (2021). *Farm labour in the UK: accessing the workforce the industry needs*. http://socialsciences.exeter.ac.uk/media/universityofexeter/research/microsites/centreforruralpolicyresearch/pdfs/researchreports/Farm_labour_in_the_UK._Accessing_the_workforce_the_industry_needs_.pdf

O'Neill, C., Lim, F.K.S., Edwards, D.P. & Osborne, C.P. (2020). Forest regeneration on European sheep pasture is an economically viable climate change mitigation strategy. *Environmental Research Letters*, in press. https://iopscience.iop.org/article/10.1088/1748-9326/abaf87/pdf

OF&G. (2020). *OF&G Organic Standards: Livestock Production Standards*. https://assets.ofgorganic.org/cm-8-livestock.j7dthv.pdf

Office For National Statistics. (2016). 'Output areas'. https://www.ons.gov.uk/census/2001censusandearlier/dataandproducts/outputgeography/outputareas

Office for National Statistics. (2018, February). *Labour in the agriculture industry, UK: February (2018).* https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/articles/labourintheagricultureindustry/2018-02-06

Office for National Statistics. (2018, February). *Labour in the agriculture industry, UK: February 2018.* https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/articles/labourintheagricultureindustry/2018-02-06

Office for National Statistics. (2019a). *Estimates of the population for the UK, England & Wales, Scotland & Northern Ireland*. [Dataset]. https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland

Office For National Statistics. (2019b). Rural Urban Classification (2011) of Output Areas in England & Wales. Dataset. https://geoportal.statistics.gov.uk/datasets/rural-urban-classification-2011-of-output-areas-in-england-and-wales.

Office For National Statistics. (2019c). Postcode to Output Area to Lower Layer Super Output Area to Middle Layer Super Output Area to Local Authority District (February 2019) Lookup in the UK. Dataset. http://geoportal.statistics.gov.uk/datasets/postcode-to-output-area-to-lower-layer-super-output-area-to-middle-layer-super-output-area-to-local-authority-district-february-2019-lookup-in-the-uk

Oglethorpe, D. & Heron, G. (2013). Testing the theory of constraints in UK local food supply chains. *International Journal of Operations & Production Management*, 33(10), 1346-1367

Old Hall Farm. (2019). *What is a microdairy?* http://www.oldhallfarm.co.uk/about-us/what-is-a-microdairy/

Olfert, M.R. (1992). Nonfarm, employment as a response to underemployment in agriculture. *Canadian Journal of Agricultural Economics*, 40(3), 443-458. https://doi.org/10.1111/j.1744-7976.1992.tb03706.x

Olper, A., Raimondi, V., Cavicchioli, D., & Vigani, M. (2014). Do CAP payments reduce farm labour migration? A panel data analysis across EU regions. *European Review of Agricultural Economics*, 843-873

Organic Research Centre. (2014). *Making legumes do the leg work* (9th Organic Producers' Conference, Thursday 27 November (2014)). http://www.efrc.com/?go=Information%20and%20publications&page=Nov2014Conf_legumes

Orsini, S., Padel, S., & Lampkin, N. (2018). Labour use on organic farms: a review of research since 2000. *Organic Farming, 4*(1), 7-15

Oya, C., Schaefer, F., Skalidou, D., McCosker, C. & Langer, L. (2017). *Effects of certification schemes for agricultural production on socio-economic outcomes in low- and middle-income countries: A systematic review*. International Initiative for Impact Evaluation. http://www.3ieimpact.org/media/filer_public/2017/03/15/sr34-certification-schemes-agricultural-production_yNjL1OW.pdf

Padel, S. (2017). Introduction to global markets & marketing of organic food. In Karaklas I. & Muehling D.(Eds). *Deciphering organic foods: A comprehensive guide to organic food consumption*, Chapter 8. Nova Publishing, Hauppauge. https://core.ac.uk/reader/77086582

Padel, S., Rubinstein, O., Woolford, A., Egan, J., Leake, A., Levidow, L., Pearce, B. & Lampkin, N. (2018). *Transitions to agroecological systems: Farmers' experience*. (A report for the Landuse Policy Group). Organic Research Centre and Game & Wildlife Conservation Trust. https://www.nature.scot/sites/default/files/2018-04/Transitions%20to%20Agroecological%20Systems%20-%20Farmers%20Experience%20-%20LUPG%20Report%20-%20March%202018.pdf

Palczynski, L., Bleach, E., Brennan, M.L. and Robinson, P.A.(2020). Giving calves 'the best start': Perceptions of colostrum management on dairy farms in England. *Animal Welfare*, 29(1), 45-58

Pallant. J. (2016). *SPSS survival manual: a step by step guide to data analysis using SPSS program* (sixth edition). McGraw-Hill Education

Pappuller. (2017, March 16). *Wall chart* [Online forum post]. The Farming Forum. https://thefarmingforum.co.uk/index.php?threads/wall-charts.163664/

Pelletier, N. (2016). *Sustainable Sourcing Activities for Agricultural Products in Canada.* Global Ecologic. http://www.albertaefp.com/wp-content/uploads/2015/09/Global-Ecologic_Sustainable-Sourcing-Activities-22_04_(2016).pdf

Petit, S., Dobremez, L. & Fleury, P. (2006). Working conditions: a challenge for sustainability of mountain family farming systems diagnosis at farm level and responses designed by farmers in the Alps. In Langeveld, H. and N.G. Roling, N.G. (Eds.). *Changing European farming systems for a better future: new visions for rural areas* (pp. 272-276). Wageningen Academic Publishers,

Petrick, M. and Zier, P. (2012). Common Agricultural Policy effects on dynamic labour use in agriculture. *Food Policy*, 37, 671-678.

Peyraud, J-L., Taboada, M. & Delaby, L. (2014) Integrated crop & livestock systems in Western Europe and South America: A review. *European Journal of Agronomy*, 57: 31-42

PFLA (Pasture Fed Livestock Association). (2014). *Pasture For Life Certification Standards for Ruminant Livestock, February (2016).* https://www.pastureforlife.org/media/2014/03/PFLA-standards.pdf

PFLA. (2016). *Pasture for Life: It can be done. The farm business case for feeding ruminants just on pasture*. https://www.pastureforlife.org/media/2018/10/Pasture-for-Life-It-can-be-done-e-version-Oct-18.pdf.

PFLA. (2020a). *Certification Standards for Ruminant Livestock, Version 4.0*. (May 2020). https://www.pastureforlife.org/media/2020/08/PfL-Standards-Update-Version-4.0-FINAL-v2.pdf

PFLA. (2020b). *Membership and certification*. https://www.pastureforlife.org/members/#benefits

Piketty, T. (2014). *Capital in the twenty-first century.* The Belknap Press

Pimbert, M.P., Thompson, J. & Vorley, W.T. (2001). *Global restructuring, agri-food systems and livelihoods*. (Gatekeep Series no. 100). International Institute for Environment and Development. https://pubs.iied.org/pdfs/9166IIED.pdf

Pomeroy, A. (2015). Resilience of family farming 1984-2014: case studies from two sheep/beef hill country districts of New Zealand. *New Zealand Geographer*, 71, 146-158. **https://doi.org/10.1111/nzg.12106**

Porter, R. (2014). *Block-calving benefits*. (Series: Efficient Dairying.) Cow Management, April/May 2014. https://edepot.wur.nl/303156

Price, R. (2019, August 21). *Farmers Weekly awards: Grassland Manager finalists (2019)*. Farmers Weekly. https://www.fwi.co.uk/events/awards/farmers-weekly-awards-grassland-manager-finalists-2019

Proforest. (2017). *Quantifying sustainability risks among suppliers and certificate holders: Best practices and lessons learned*. (A study commissioned by ISEAL Alliance). https://www.isealalliance.org/sites/default/files/resource/2019-02/ISEAL_Proforest%20Risk%20study_report_Jan2017_Final.pdf

Pullman, N. (2017, December 18). *Red Tractor to be accepted by Tesco and GlobalGap*. Fresh Produce Journal. http://www.fruitnet.com/fpj/article/174280/red-tractor-to-be-accepted-by-tesco-and-globalgap

Punch, K. (1998). *Introduction to social research: quantitative and qualitative approaches*. Sage

QMS. (2013). *Cattle & sheep enterprise profitability in Scotland.* https://www.qmscotland.co.uk/sites/default/files/qms-cattle-and-sheep-enterprise-profitability-2013_0_0.pdf

RABDF. (2017). *The Importance of European Union Labour to the UK Dairy Sector*. https://www.rabdf.co.uk/labour

Rao, E.J.O. & Qaim, M. (2013). Supermarkets and agricultural labor demand in Kenya: a gendered perspective. *Food Policy*, 38, 165-176

Rawley, E. & Simcoe, T.S. (2010). Diversification, diseconomies of scope, & vertical contracting: evidence from the taxicab industry. *Management Science*, 56(9), 1534-1550.

RBR (Rural Business Research). (2020). *FBS definitions.* www.farmbusinesssurvey.co.uk/benchmarking/Default.aspx?module=DefOfTerms#FBusIncm

RBR (Rural Business Research). (2021). *FBS Data Builder*. [Online database]. http://www.farmbusinesssurvey.co.uk/databuilder/

RBR (Rural Business Research). (Unknown date, accessed on 15 September 2020). *Calculating enterprise net margins.* http://www.farmbusinesssurvey.co.uk/about/Teaching-Materials/downloads/NetMargins.pptx

Rebanks, J. [@herdyshepherd1]. (2020, December 2020). And like lots of folk I almost never get a day off as we don't have any staff - it takes me minimum 4 hours to get the basic jobs done each morning (is usually 6-7). It doesn't bother me mostly but some days when it's rained for weeks I think I'm a bit sick of this today [Tweet]. Twitter. https://twitter.com/herdyshepherd1/status/1340563679113334785

Red Tractor Assurance. (2014). *Annual Review 2013.* https://assurance.redtractor.org.uk/who-we-are/annual-reviews

Red Tractor Assurance. (2016). *Annual Review 2015*. https://assurance.redtractor.org.uk/contentfiles/RedTractor-573.pdf?_=635729875939800918

Red Tractor Assurance. (2018a). *Beef & Lamb Standards. Version 4.1. 1st October 2017 (updated 1st June 2018).* https://assurance.redtractor.org.uk/contentfiles/Farmers-6800.pdf?_=637311861276662190

Red Tractor Assurance. (2018b). *Red Tractor version 4 standard changes document: beef and lamb*. https://assurance.redtractor.org.uk/contentfiles/Farmers-6961.pdf?_=636737368590674381

Red Tractor Assurance. (2018c). *Responsible use of antibiotics on Red Tractor dairy farms: guidance for farmers*. (March 2018). https://assurance.redtractor.org.uk/contentfiles/Farmers-6910.pdf?_=636585120315070190

Red Tractor Assurance. (2020). Proposed new standards – October (2021). Consultation June (2020). https://assurance.redtractor.org.uk/contentfiles/Farmers-7116.pdf?_=637275721242736171

Red Tractor Assurance. (u.d.a.) *Tips to avoid non-conformances: Red Tractor Beef & Lamb*. https://assurance.redtractor.org.uk/contentfiles/Farmers-6722.pdf?_=636177452308970526

Red Tractor Assurance. (u.d.b.) *Tips to avoid non-conformances: Red Tractor Dairy*. https://assurance.redtractor.org.uk/contentfiles/Farmers-6723.pdf?_=636997538652777766

Red Tractor Assurance. 2019b. *Getting your dairy business audit-ready ahead of a Red Tractor assessment*. https://assurance.redtractor.org.uk/contentfiles/Farmers-7010.pdf?_=636924036596837602

Red Tractor Farm Assurance. (2010, January). *Changes to beef and lamb standards*. Newsletter. https://assurance.redtractor.org.uk/contentfiles/Farmers-5880.pdf?_=635912156722513727

Red Tractor. (2015). *Annual Review 2015.* https://www.redtractor.org.uk/contentfiles/RedTractor-573.pdf

Redman, G. (2017). *John Nix Pocketbook for Farm Management for 2018.* Agro Business Consultants Ltd.

Reed, M., Lewis, N., & Dwyer, J. (2017). *The effect and impact of leaf marque in the delivery of more sustainable farming: a study to understand the added value to farmers*. CCRI. http://www.standardsimpacts.org/sites/default/files/LEAF_Marque_Value_Study_Full_Report.pdf

Renting, H. & Oostindie, H. (2008). Multifunctionality of agricultural activities, changing rural identities and new institutional arrangements. *International Journal of Agricultural Resources, Governance and Ecology*, 7(4/5), 361-386

RESOLVE. (2012). *Toward sustainability: The roles and limitations of certification*. (Steering Committee of the State-of-Knowledge Assessment of Standards & Certification). RESOLVE, Inc. http://www.resolv.org/site-assessment/files/2012/06/Toward-Sustainability-report-summary-and-appendicesv2.pdf

Reynolds, R. & SriRamaratnam, S R. (1990). How farmers responded. In R. Sandrey & R. Reynolds (Eds). *Farming without subsidies: New Zealand's recent experience* (pp. 157-182). Wright & Carman,

Riley, (2020, January 2). *Small abattoirs: How farmers are fighting for their future*. Farmers Weekly.

Rimmington. N. (2012). *Traditional orchards and the historic environment*. (Report for the Malvern Hills AONB). Herefordshire Archaeology. https://public.worcestershire.gov.uk/sites/archaeology/Reports/SWR21247.pdf

Robbins, P. (2004). *Political ecology*. Blackwell

Robinson, C., McMahon, P. and Quiggin, J. (1982). Labour supply and off-farmwork by farmers: theory and estimation. *Australian Journal of Agricultural Economics*, 26(1), 23-38

Robinson, P.A. (2017). Farmers & bovine tuberculosis: contextualising statutory disease control within everyday farming lives. *Journal of Rural Studies*, 55, 168-180

Robinson, W.C. (1969). Types of disguised rural unemployment & some policy implications. *Oxford Economic Papers*, 21(3), 373-386

Roche, J.R. Berry, D.P. Bryant, A.M. Burke, C.R. Butler, S.T. Dillon, P.G. Donaghy, D.J. Horan, B. Macdonald, K.A. & Macmillan, K.L.. (2017). A 100-Year Review: A century of change in temperate grazing dairy systems. *Journal of Dairy Science*, 100(12), 10189-10233

Röhrig, N., Hassler, M. & Roesler, T. (2021) Silvopastoral production as part of alternative food networks: Agroforestry systems in Umbria and Lazio, Italy. *Agroecology and Sustainable Food Systems*, 45(5), 654-672. DOI: 10.1080/21683565.2020.1835783

Rose, D.C., Keating, C. & Morris, C. (2018). *Understanding how to influence farmers' decision-making behaviour: A social science literature review*. (A report for AHDB.) https://ahdb.org.uk/knowledge-library/understand-how-to-influence-farmers-decision-making-behaviour

RPA. (2020). *Mid Tier and Wildlife Offers manual for 1 January 2020 agreements: Countryside Stewardship*. https://www.gov.uk/government/publications/mid-tier-and-wildlife-offers-manual-for-1-january-2020-agreements-countryside-stewardship

Rueff, C., Choisis, J-P., Balent, G. & Gibon, A. (2012). A preliminary assessment of the local diversity of family farms change trajectories since 1950 in a Pyrenees mountains area. *Journal of Sustainable Agriculture*, 36:5, 564-590. DOI: 10.1080/10440046.2012.672547

RUMA (Responsible Use of Medicines in Agriculture). (2019, October 17). *Red Tractor change cuts highest priority antibiotics by 92% in study*. https://www.ruma.org.uk/red-tractor-change-cuts-highest-priority-antibiotics-by-92-in-study/

RUMA. (2020). *Targets Task Force Report (2020).* https://www.ruma.org.uk/wp-content/uploads/2020/11/SO-469-RUMA-REPORT-021220.pdf

Rural Payments Agency. (2018). *Basic Payment Scheme: Rules for 2018.* UK Government. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/705756/BPS_2018_scheme_rules_v5.0.pdf

Rye, J. F., & Scott, S. (2018). International labour migration and food production in rural Europe: a review of the evidence. *Sociologia Ruralis, 58*(4), 928-952

Sagoo, L., Bogal, A., Williams, J. & Tatnell, L. (2018). *Grass and herbal leys farm network. (Final report to AHDB and Defra)*. http://beefandlamb.ahdb.org.uk/wp-content/uploads/2019/01/91110083-Grass-herbal-ley-network-Final-report-190718_MV-1.pdf

Sainsbury's. (2020). *Animal health and welfare report 2020*. https://www.about.sainsburys.co.uk/~/media/Files/S/Sainsburys/CRS%20Policies%20and%20Reports/0920%20-%20Animal%20Welfare%20Report%20V1.pdf

Savage, J. (1990). Rural employment and labour adjustments. In R. Sandrey & R. Reynolds (Eds). *Farming without subsidies: New Zealand's recent experience* (pp. 210-232). Wright & Carman,

Saxby, H., Gkartzios, M., & Scott, K. (2018). 'Farming on the edge': wellbeing and participation in agri-environmental schemes. *Sociologia Ruralis, 58*(2), 392-411

Schader, C. et al. (2015). Impacts of feeding less food-competing feedstuffs to livestock on global food system sustainability. *Journal of the Royal Society*, 12(113)

Schewe, R.L. 2015. Letting go of 'conventionalisation': family labour on New Zealand organic dairy farms. *Sociologia Ruralis,* 55, 1. https://static1.squarespace.com/static/58e963f2b8a79b774a41fb3d/t/58efd4c4d1758e9c13664c76/1492112581158/2015+Sociologia+Ruralis.pdf

SCOPS. (2019). *Know your anthelmintics*. https://www.scops.org.uk/about/scops-know-your-anthelmintics-guide/

Scott, J.C. 1985. *Weapons of the Weak: Everyday Forms of Peasant Resistance.* Yale University Press

Select Committee on the Rural Economy. (2019). *Time for a strategy for the rural economy*. HL Paper 300. Authority of the House of Lords. https://publications.parliament.uk/pa/ld201719/ldselect/ldrurecon/330/330.pdf

Shadbolt, N., Olubode-Awosola, F. & Rutsito, B. (2017). Resilience in dairy farm businesses; to 'bounce without breaking'. *Journal Of Advances In Agriculture*, 7(3), 1138-1150

SHAFFE (Southern Hemisphere Association of Fresh Fruit Exporters). (2009). *Guide to environmental requirements, social and good agricultural practice (GAP) for supermarket chain*. (Report for Chilean Exporters Association ASOEX). https://fpsc-anz.com/wp-content/uploads/2015/02/shaffe-guide-to-international-retailer-qa-requirements-june-2011.pdf

Sharpe, R. (2019). *Voices from the field: Can farmers champion health* (Food Research Collaboration). https://www.thersa.org/action-and-research/rsa-projects/public-services-and-communities-folder/food-farming-and-countryside-commission/research

Sheeplameness.co.uk. (n.d.) *Sheep lameness*. http://www.sheeplameness.co.uk/Reduce-Disease-Challenge-Quarantine-avoid.aspx

Short, C.J. & Dwyer, J. (2012). Reconciling pastoral agriculture & nature conservation: developing a co-management approach in the English uplands. *Pastoralism: Research, Policy & Practice*, 2(13)

Shorthall, O. (2019). Cows eat grass, don't they? Contrasting sociotechnical imaginaries of the role of grazing in the UK & Irish dairy sectors. *Journal of Rural Studies*, 72, 45-57

Sibley, R. (2006). Developing health plans for the dairy herd. *In Practice*, 28, 114-121

Sifaki, E. (2014). *Gendered societal transitions: The shifting role of women in the table grape production network from Archanes, Greece to Europe*. (Doctoral dissertation, University of Manchester). https://www.escholar.manchester.ac.uk/api/datastream?publicationPid=uk-ac-man-scw:263774&datastreamId=FULL-TEXT.PDF

Skuras, D. & Dubois, A. (2015). Business networks, translocal linkages and the way to the New Rural Economy. In A. Copus & P. de Lima (Eds), *Territorial cohesion in Europe*: *The relational turn in rural development* (151-172), Routledge

Smith, D., McHoul, H. & Wilson, P. (2018). *Farm Business Survey 2016/17: Dairy Farming in England*. https://www.ruralbusinessresearch.co.uk/archive-publications/

Smith, N. (2021). *Tesco Agriculture Strategy*. (Presentation at University of Reading Agriculture Club conference, 26 January 2021.)

Smith, R. (2017, 30 January). *Housing and shearing sheep in January*. Agricology blog. www.agricology.co.uk/field/blog/housing-and-shearing-sheep-january

Smith, R., McElwee, G. & Somerville, P. (2017). Illegal diversification strategies in the farming community from a UK perspective. *Journal of Rural Studies*, 53, 122-131

Soil Association. (2018). *Digging into horticulture: encouraging the next generation of producers*. (Soil Association Policy Report). https://www.soilassociation.org/news/2018/june/25/digging-into-horticulture/

Soil Association. (2018). *Digging into horticulture: Encouraging the next generation of producers.* (Soil Association Policy Report). https://www.soilassociation.org/news/2018/june/25/digging-into-horticulture/

Soil Association. (2019). *Farming & growing standard, May (2019)*. www.soilassociation.org/media/15931/farming-and-growing-standards.pdf

Soil Association. (2020a). *Grants for converting to organic – England*. https://www.soilassociation.org/certification/farming/what-is-organic-certification/financial-information/organic-management-conversion-england/

Soil Association. (2020b). *Organic Market Report 2020 published*. https://www.soilassociation.org/press-centre/press-releases/omr-2020/

Soil Association. (2020c). *Summary of standards changes: organic standards documents updated Thursday 9th January 2020 – version 18.2*. https://www.soilassociation.org/media/20449/sa-standards-version-182-summary-of-changes.pdf

Soon, J.M. & Baines, R.N. (2013). Public and private food safety standards: facilitating or frustrating fresh produce growers? *Laws*, 2, 1-19

Souza Monteiro, D.M & Caswell, J.A. (2009). Traceability adoption at the farm level: an empirical analysis of the Portuguese pear industry. *Food Policy*, 34, 94-101

Sovani, N.V. (1959). Underemployment, removable surplus & the saving fund. *Population Index*, 25(4),332-337. https://dspace.gipe.ac.in/xmlui/bitstream/handle/10973/27230/av-1959-mar-3-abs.pdf?sequence=2

Spence, L. & Bourlakis, M. (2009). The evolution from corporate social responsibility to supply chain responsibility: the case of Waitrose. *Supply Chain Management*, 14(4), 291-302

Stan, V., Fîntîneru, G., & Mihalache, M. (2014). Multicriteria analysis of the effects of field burining crop residues. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 42*(1), 255-262

StatsWales. (2020). *Robust farm type by area*. [Dataset]. Agricultural Survey, Area survey results. https://statswales.gov.wales/Catalogue/Agriculture/Agricultural-Survey/Farm-Types/robust-farm-type-by-area

Steedman, P. & Falk, T. (2009). *From A to B: A snapshot of the UK food distribution system*. Food Ethics Council. https://www.foodethicscouncil.org/uploads/publications/Snapshot(web)_0.pdf

Steering Committee of the State-of-Knowledge Assessment of Standards and Certification. (2012). *Toward sustainability: The roles and limitations of certification.* RESOLVE, Inc. www.resolv.org/site-assessment/files/2012/06/Toward-Sustainability-report-summary-and-appendicesv2.pdf

Sustain. (2021). *Battle of the food campaigns*. https://www.sustainweb.org/news/veganuary_regenuary/

Sutherland, L-A. and Calo, A. (2020). Assemblage and the 'good farmer': New entrants to crofting in Scotland. *Journal of Rural Studies*, 80, 532-542

Sutherland, L-A., Burton, R.J.F., Ingram, J., Blackstock, K., Slee, B. and Gotts, N. (2012). Triggering change: towards a conceptualisation of major change processes in farm decision-making. *Journal of Environmental Management*, 104, 142-151

Sutherland, L-A., Wilson, G.A. and Zagata, L. (2015). Introduction. In L-A. Sutherland, I. Darnhofer, G.A. Wilson and L. Zagata (Eds). *Transition Pathways towards Sustainability in Agriculture: Case Studies from Europe* (1-15). CABI

Swales, D. (2021). *The UK–Australia free trade deal: how is it significant for UK agriculture?* AHDB Horizon blog. https://ahdb.org.uk/news/trade-and-policy/horizon-blog-uk-australia-FTA

SwamHub. (2019). *The feeding value of herbal leys*. https://www.swarmhub.co.uk/upcoming-events/the-feeding-value-of-herbal-leys/

Talbot, M. (2015). *Farm tourism in Wales: a new peasantry perspective*. (Doctoral dissertation, University of Aberystwyth). https://cadair.aber.ac.uk/dspace/bitstream/handle/2160/44636/Talbot_M.pdf?sequence=2&isAllowed=y

Tasker, J. (2018, 3 December). *Lower Hope Estate: careful management is focus for traditional mixed operation*. Midland Farmer. http://midlandfarmer.co.uk/?p=3911

Tasker, J. (2021, April 16). *Fatal accidents rate on UK farms at its highest*. Farmers Weekly. www.fwi.co.uk/business/business-management/health-and-safety/fatal-accidents-rate-on-uk-farms-at-its-highest

TechnoMoffat Agriculture Photography. (2018, February 5). *Feeding the Cattle with New Holland & Abbey Diet Feeder* [Video]. YouTube. https://www.youtube.com/watch?v=Xybr7i2BFBw

Tesco. (2020). *More information on our UK animal welfare*. https://www.tescoplc.com/sustainability/publications/policies/downloads/animal-welfare-policy-group/more-information-on-our-uk-animal-welfare/

The Prince's Countryside Fund. (2016). *The cash flow crisis in farming and its implications for the wider rural economy*. https://www.princescountrysidefund.org.uk/downloads/research/cash-flow-crisis-in-farming-report-april-(2016).pdf

Toschi Maciel, C. and Bock, B. (2013). Modern politics in animal welfare: the changing character of governance of animal welfare and the role of private standards. *International Journal of Sociology of Agriculture and Food*, 20(2), 219-235

Tully, M.P. (2014). Research: articulating questions, generating hypotheses, and choosing study designs. *Canadian Journal of Hospital Pharmacy,* 67(1), 31-34

Tyler, L. & Lattimore, R. (1990). Assistance to agriculture. In R. Sandrey & R. Reynolds (Eds), *Farming without subsidies: New Zealand's recent experience* (pp. 60-79). Wright & Carman

UK Parliament. (2010). *Farming in the uplands*. (Written evidence submitted by Department for Environment, Food and Rural Affairs (Uplands 18)). https://publications.parliament.uk/pa/cm201011/cmselect/cmenvfru/writev/556/18.htm

USDA. (2021). *Organic regulations*. https://www.ams.usda.gov/rules-regulations/organic

Vaessen, J. & Bastiaensen, J. (1999). *Social capital and institutions: In search of a conceptual framework for the analysis of local rural development.* Research paper 9-036. University of Antwerp, Faculty of Applied Economics

Van den Berg, R.G. (2016). *SPSS Kruskal-Wallis test – simple tutorial with example*. SPSS-Tutorials.com. https://www.spss-tutorials.com/spss-kruskal-wallis-test-simple-tutorial-with-example/

Van der Ploeg, J. D., & Renting, H. (2000). Impact and potential: a comparative review of European rural development practices. *Sociologia Ruralis, 40*(4), 529-43

Waitrose. (2017). *Animal welfare at Waitrose*: *Welfare outcomes and Key Performance Indicators (KPIs)*. https://www.waitrose.com/content/dam/waitrose/Inspiration/Waitrose%20Way/Animal%20welfare/BBFAW%20KPI%20Final.pdf

Waitrose. (2020). *Animal welfare*. https://www.waitrose.com/home/inspiration/about_waitrose/the_waitrose_way/waitrose_animal_welfarecommitments.html

Walker, B., Holling, C.S., Carpenter, S.R. & Kinzig, A. (2004). Resilience, adaptability and transformability in socio-ecological systems. *Ecology and Society*, 9(2)

Wallace, N. (2014). *When the farm gates opened: The impact of Rogernomics on rural New Zealand*. Otago University Press

Webster, S., Nickson, A., Fawcett, J. & Allen, J. (2008). *Measuring, identifying and demonstrating factors affecting dairy farm labour productivity*. (Technical report to DairyCo). https://dairy.ahdb.org.uk/resources-library/research-development/business-management/labour-productivity-final-report/#.XuYIZEVKhPY

Welsh Government. (2018). *CPH and livestock movements: New rules.* https://gov.wales/sites/default/files/publications/2018-07/county-parish-holdings-and-livestock-movements-new-rules.pdf

Whatmore, S. (1991). *Farming Women: Gender, Work and Family Enterprise*. Macmillan

Wilkinson, I., Lane, S. & Mountain, F. (2016). *Mob grazing: A farmer's guide*. Cotswold Seeds Ltd. https://www.cotswoldseeds.com/downloads/mob%20grazing%20website.pdf

Willett, W. et al. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393 (10170), 447-492

Willock, J., Deary, I.J., McGregory, M.M., Sutherland, A., Edwards-Jones, G., Morgan, O., Dent, B., Grieve, R., Gibson, G. & Austin, E. (1999). Attitudes, objectives, behaviors, and personality traits: the Edinburgh study of decision making on farms. *Journal of Vocational Behaviour*, 54, 5-36

Wilson, G.A. & Hart, K. (2000). Financial imperative or conservation concern? EU farmers' motivations for participation in voluntary agri-environmental schemes. *Environment and Planning A*, 32, 2161-2185

Wilson, G.A. (2008). From 'weak' to 'strong' multifunctionality: Conceptualising farm-level multifunctional transitional pathways. *Journal of Rural Studies*, 24(3), 367-383

Wiltshire Council. (2019). 'Key characteristics of Wiltshire & Swindon'. http://www.wiltshire.gov.uk/minerals_core_strategy_july_2009_-_chapter_2_key_characteristics_of_wiltshire_and_swindon.pdf

Winter, M. & Lobley, M. (2016). *Is there a future for the small family farm in the UK?* (Report to The Prince's Countryside Fund). Prince's Countryside Fund. https://www.princescountrysidefund.org.uk/downloads/research/is-there-a-future-for-the-small-family-farm-in-the-uk-report.pdf

Woodland Trust. (2017). *Mob grazing & creating new hedgerows for livestock shelter in Cumbria*: *case study*. https://www.woodlandtrust.org.uk/media/1715/mob-grazing-and-hedgerows-for-livestock.pdf

Worsfold, D. (2018, October 22). *Farm safety: fatal farms.* Insurance Post.

Xiloyannis, C., Martinez Raya, A., Kosmas, C., & Favia, M. (2008). Semi-intensive olive orchards on sloping land: Requiring good land husbandry for future development. *Journal of Environmental Management, 89*, 110-119

Xiloyannis, C., Martinez Raya, A., Kosmas, C., & Favia, M. (2008). Semi-intensive olive orchards on sloping land: Requiring good land husbandry for future development. *Journal of Environmental Management, 89*, 110-119.

Yates, J. (2019, May 10). *So you want to sell milk direct from the farm?* Farmers Weekly

Zaralis, K. (2015). *SOLID participatory research from UK: mob grazing for dairy farm productivity*. Organic Research Centre. http://www.solidairy.eu/wp-content/uploads/Final_Report_UK_Mob_Grazing.pdf

Appendices

Appendix 1. Supermarket information sources

Sources of information used to assess buyer requirements of UK supermarkets.

Supermarket	Information	Source
Aldi	Animal Welfare Policies and Performance	https://cdn.aldi-digital.co.uk/ $3MecVZ0AqI$NpnnmJMIX9IjvqQ.pdf
Coop	Animal Welfare Standards & Performance and Coop Antibiotics Policy	https://assets.ctfassets.net/bffxiku554r1/ 2l3meYk2jLxPpKWTARwCWR/ 628e67df6e119d2cd8ae7012578d8ca6/Co-op_Animal_Welfare_Standards__Performance_and_Co-op_Antibiotic_Policy_v4.pdf
	'Beef farmers'	www.coop.co.uk/our-suppliers/farmers/beef
	'Dairy farmers'	www.coop.co.uk/our-suppliers/farmers/dairy
	'Our farmers'	www.coop.co.uk/our-suppliers/farmers
Marks & Spencer	Marks and Spencer policy for farm animal health and welfare, June 2017	https://corporate.marksandspencer.com/ documents/plan-a-our-approach/foods/ mns-farm-animal-health-and-welfare-policy.pdf
	'Beef, lamb and venison'	https://corporate.marksandspencer.com/ sustainability/food-and-household/product-standards/ raw-materials-commodities-and-ingredients/beef-lamb-venison
	'Dairy'	https://corporate.marksandspencer.com/sustainability/ food-and-household/product-standards/raw-materials-commodities-and-ingredients/dairy
Morrisons	Corporate Responsibility Report 2019/20	www.morrisons-corporate.com/cr/corporate-responsibility/
	Farm Animal Health & Welfare Report 2019/20	www.morrisons-farming.com/globalassets/farming/documents/fahw-report-2019_20_final.pdf
Sainsbury's	Animal Health & Welfare Report 2020	www.about.sainsburys.co.uk/~/media/Files/S/Sainsburys/ CRS%20Policies%20and%20Reports/0920%20-%20Animal%20Welfare%20Report%20V1.pdf
Tesco	Antibiotics policy	www.tescoplc.com/sustainability/publications/ policies/downloads/animal-welfare-policy-group/antibiotics/
	Global Animal Welfare Policy	www.tescoplc.com/sustainability/ product/animal-welfare-policy-group/
	Tesco Sustainable Dairy Group Johne's Disease Policy	www.actionjohnesuk.org/wp-content/uploads/2016/12/AJC-8.pdf
	UK Animal Welfare Policy	www.tescoplc.com/sustainability/publications/ policies/downloads/animal-welfare-policy-group/ more-information-on-our-uk-animal-welfare/

Supermarket	Information	Source
Waitrose	'About our dairy'	www.waitrose.com/home/inspiration/about_waitrose/about_our_food/waitrose_dairy.html
	'Animal welfare'	www.waitrose.com/home/inspiration/about_waitrose/the_waitrose_way/waitrose_animal_welfarecommitments.html
	Animal Welfare At Waitrose & Partners, September 2020	www.waitrose.com/content/dam/waitrose/Inspiration/Waitrose%20Way/Animal%20welfare/BBFAW%20KPI%20Report%202020%20.pdf

Appendix 2. Copy of questionnaire

Section 1: Details of your business

1. What is the nature of your business?

☐ Farm or estate ☐ Grazing business (I graze animals on other people's land) ☐ Both

2. What do you farm?

☐ Dairy ☐ Beef ☐ Sheep

☐ Arable ☐ Field-scale vegetables ☐ Horticulture or orchards ☐ Pigs ☐ Poultry

If you do not have any cattle or sheep, there is no need to complete this questionnaire. Please return the questionnaire using the pre-paid envelope and write 'no cattle or sheep' on it.

3. How much land do you farm in total?

_________ ha (or _________ acres)

4. What kind of land do you farm?

☐ Upland or hill farm ☐ Lowland ☐ Both

5. Do you do any agricultural contracting work for other farms?

☐ Yes ☐ No

6. Do you have a diversification business? *(e.g. farm shop, bed and breakfast, shooting, building rental)*

☐ Yes ☐ No

7. What is your role in the farm business? *(tick one)*

☐ Farm owner or business owner ☐ Tenancy holder

☐ Employed farm manager ☐ Partner or spouse

☐ Other *Please describe:* ____

8. Who do you sell your animals and produce to? *(tick all that apply)*

	Supermarket (direct or aligned contract)	**Processor or cooperative**	**Market, wholesaler, agent or trader**	**Direct marketing straight to customers**	**Other**
Dairy (cattle or dairy):	☐	☐	☐	☐	☐
Beef (animals or meat):	☐	☐	☐	☐	☐
Sheep (animals or meat):	☐	☐	☐	☐	☐
Other farm produce:	☐	☐	☐	☐	☐

9. Are you part of any of the following schemes? *(tick all that apply)*

a. Farm assurance and certification:

☐ Red Tractor (FABBL) ☐ LEAF ☐ RSPCA Assured (Freedom Food) ☐ Pasture For Life

☐ UK organic (OF&G, Soil Association, other) ☐ United States National Organic Program

☐ Other *Please name:* ______________________________

b. Supermarket or processor's scheme *(e.g. Waitrose; Co-op Lamb Farming Group; Arlagarden)*

☐ Yes ☐ No

c. Government stewardship scheme:

☐ Countryside Stewardship ☐ Entry Level Stewardship or Higher Level Stewardship

☐ Other *Please describe:* ____________________

Section 2: Your cattle and sheep farming systems

10. What housing system do you use for your animals? *(tick all that apply)*

	Dairy:	Beef:	Sheep:
Year-round indoor housing	☐	☐	☐
Year-round outdoor grazing	☐	☐	☐
Outdoor grazing with winter housing	☐	☐	☐

11. What feed and grazing system do you currently follow? *(tick all that apply)*

	Dairy:	Beef:	Sheep:
Unrestricted grazing in a single area. (Set stocking)	☐	☐	☐
Rotational grazing between fields.	☐	☐	☐
Intensive rotational grazing on paddocks. (Strip grazing, mob grazing, AMP)	☐	☐	☐
Zero grazing, but we produce forage for housed animals. (Cut and carry)	☐	☐	☐
Zero grazing, and no grass forage is produced on the farm. (Landless system)	☐	☐	☐

12. What calving or lambing system do you follow? *If not applicable, skip to next question*

☐ Block calving once a year ☐ Block calving twice a year ☐ All-year-round calving

☐ Indoor lambing once a year ☐ Indoor lambing more than once a year

☐ Outdoor lambing once a year ☐ Outdoor lambing more than once a year

13. What milking schedule do you follow? *If you do not do milking, skip to next question*

☐ Milking two times or more a day ☐ Milking once a day ☐ Robotic milking (AMS)

14. Have you made any significant changes to your farming system or marketing in the past 2–3 years which have **increased** your workload or your need for workers or contractors? *(e.g. changed breeds, changed feeding system, changed marketing channel)*

☐ Yes ☐ No

If yes, please describe: ____________________

____

15. Have you made any significant changes to your farming system or marketing in the past 2–3 years which have **decreased** your workload or your need for workers or contractors? *(e.g. downsized, changed feeding system, changed marketing channel, left dairy)*

☐ Yes ☐ No

If yes, please describe: ____

____

Section 3: Paperwork

16. Who handles **most** of the administrative work such as accounts, medicine book and record-keeping? *(if more than one person, tick all that apply)*

☐ Farmer or business owner

☐ Spouse or other family member

☐ Employed farm manager, secretary, or other non-family employee

☐ External adviser, vet, accountant, etc

17. As best as you can recall, how many inspections have you had on the farm in the past 12 months?

____

18. Would you say that the amount of paperwork on the farm has changed over the past 2–3 years?

☐ Increased ☐ Decreased ☐ About the same

19. What requires the most paperwork? Please tick the **top three** from the list below.

☐ Tax and accounts

☐ Livestock sales and breeding

☐ Veterinary jobs

☐ Marketing and customer management

☐ Farm assurance and certification

☐ Basic Payment Scheme

☐ Countryside Stewardship

☐ Land matters, tenancies and planning

☐ Diversification business

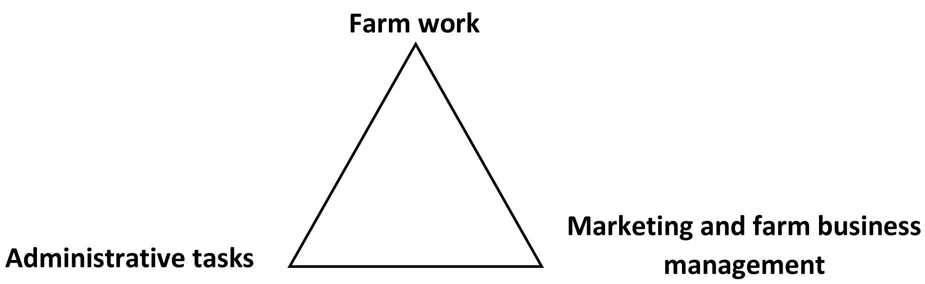
☐ Something else *(please describe)*: ____

☐ Don't know

20. How would you describe the current level of paperwork?

☐ Manageable ☐ Excessive ☐ Don't know

21. Overall, where would you say you personally spend your time, between farmwork, administrative tasks, marketing and managing the farm business? Draw a dot inside this triangle.



Section 4: Your workforce

22. Including any farm diversification business, how many people worked on the farm business in the past 12 months? *(please **write the number** in the grid below)*

	Full time (year round)	Part time (year round)	Casual or seasonal
Farm holder or business owner			
Other family members			
Employed farm manager			
Non-family workers and staff			
Students and volunteers			

23. Did you use agricultural contractors in the past 12 months?

☐ Yes ☐ No

If yes, what do the contractors do? ______________________________

____

____

24. Did you get informal help from other farmers in the past 12 months?

☐ Yes ☐ No

If yes, what did the farmers help with? ______________________________

____

____

25. Have you had difficulties recruiting workers or contractors in the past 2–3 years?

☐ Yes ☐ No

If yes, for which parts of the farm business is it most difficult to find workers or contractors?

____

____

26. How have you dealt with any shortfalls in labour? *(tick all that apply)*

☐ Postponed some planned work

☐ Changed how we farm *(e.g. downsized, used more technology, etc)*

☐ Did the work ourselves by working longer hours

☐ Did the work ourselves by spending less time in other areas of the farm business

☐ Did the work ourselves by spending less time working off the farm

☐ Hired casual labour or contractors instead

☐ Something else: ______________________________

27. Do you measure your labour productivity?

☐ Yes ☐ No ☐ Don't know

28. Do you find any of the following marketing channels useful for accessing new skills and knowledge? *(tick all that apply)*

	Sharing knowledge	Getting advice	Getting training	Don't know
Livestock market/auction	☐	☐	☐	☐
Belonging to a supermarket or producer group	☐	☐	☐	☐
Being part of a certification scheme	☐	☐	☐	☐

Section 5: Finally: looking to the future

29. The practices below are being encouraged by some buyers or industry groups. If you adopted these practices, how do you think it would affect your **workload**? Add a tick for each practice.

	Our workload would increase	Our workload would decrease	Our workload would stay the same	We already do this	Don't know	Not possible or applicable
Measures to avoid killing male dairy calves						
Reducing or eliminating the use of antibiotics						
Measures to reduce the use of anthelmintics (wormers) in sheep						
More monitoring and measuring to improve herd/flock health						
Composting manure by turning it or making windrows						
Increasing the number of days that animals graze outdoors						
More intensive, rotational grazing						
Encouraging more diverse species and legumes in the sward						

30. Are there any new requirements or legal changes in the industry that you are worried about because they will increase your workload or labour costs?

☐ Yes ☐ No

If yes, please describe: ____
____

31. Are there things that you would like to try in your farm business which will need more skills and knowledge? *(e.g. practices, marketing, diversification business)*

☐ Yes ☐ No

If yes, please describe: ____
____

Appendix 3. Livestock auction catalogues used to identify farms for survey

Livestock markets in the three study counties were identified from the website of the Livestock Auctioneers' Association (www.laa.co.uk/locate-a-mart/). Auction catalogues from a sample of markets were selected. The selection of catalogues and markets was not intended to be comprehensive, merely sufficient to provide enough farms for sampling. In Herefordshire and Shropshire, markets in both LFA and non-LFA areas were included. Markets outside the study areas which some farmers in the study areas may use were not included, which further restricted the pool of data.

Herefordshire markets

Hereford:

- Store cattle, Hereford, 9 September 2019. Paper copy.
- Breeding ewes, Hereford, 11 September 2019. http://herefordmarket.co.uk/wp-content/uploads/2019/09/sheepentry11sep.pdf
- Store cattle, Hereford, 9 September 2019. http://herefordmarket.co.uk/wp-content/uploads/2019/09/catcat19sep.pdf
- Store lambs, Hereford, 11 September 2019. http://herefordmarket.co.uk/wp-content/uploads/2019/09/sheepentry11sep.pdf
- Lambs, Hereford, 11 September 2019. http://herefordmarket.co.uk/wp-content/uploads/2019/09/sheepentry11sep.pdf

Kington (LFA area):

- Store cattle and heifers, Kington, 9 April 2019. https://mr1.homeflow.co.uk/files/site_asset/image/3779/9029/Kington_Store_Catalogue_09_04_19.pdf
- Letting out land for sheep grazing. Kington brochure, April 2019. https://mr1.homeflow.co.uk/files/site_asset/image/3779/9029/Kington_Store_Catalogue_09_04_19.pdf
- Breeding ewes, Kington, 5 September 2019. https://mr0.homeflow.co.uk/files/site_asset/image/3864/7920/Kington_Ewe_Sale_Catalogue_05_09_19.pdf?1567418245
- Store cattle, Kington, 1 October 2019, https://mr1.homeflow.co.uk/files/site_asset/image/3876/7750/Kington_Store_Catalogue_01_10_19.pdf

Ludlow (LFA area):

- Store lambs, Ludlow, 30 August 2019. Paper copy.
- Store cattle. Ludlow. 30 August 2019. Paper copy.

Shropshire markets

Shrewsbury:

- Weanlings, Shrewsbury, 11 June 2019. https://www.hallsgb.com/images/pdf/events/WEANLING-CATALOGUE-11.06.2019.pdf
- Store cattle, Shrewsbury, 20 June 2019. https://www.hallsgb.com/images/pdf/events/STORE-CATTLE-CATALOGUE--20.06.pdf
- Weanlings (cattle), Shrewsbury, 1 October 2019. https://www.hallsgb.com/images/pdf/events/WEANLING-CATALOGUE-01.10.pdf
- Store cattle, Shrewsbury, 10 October 2019. https://www.hallsgb.com/images/pdf/events/STORE-CATTLE-CATALOGUE-10.10.pdf

Bishops Castle (LFA area):

- Pedigree sale at farm, 6 September 2019, McCartneys
- Sheep, Bishops Castle, 5 October 2019. https://www.hallsgb.com/images/pdf/events/BCA-Breeding-Sheep-Sale-Sat-5th-October-19.pdf

Bridgnorth:

- Stores, Bridgnorth, 21 June 2019. https://www.nockdeightonagricultural.co.uk/sites/default/files/attachments/SS%20Flyer%2021.06.19%20EMB.pdf
- Rams, Bridgnorth, 11 September 2019. https://www.nockdeightonagricultural.co.uk/sites/default/files/attachments/2nd%20Annual%20Ram%20Sale%2011.09.19%20MC.pdf
- Sheep, Bridgnorth, 19 September 2019. https://www.nockdeightonagricultural.co.uk/sites/default/files/attachments/2nd%20Annual%20Ram%20Sale%2011.09.19%20MC.pdf

Market Drayton (note: does not publish catalogues on website):

- Sheep, Market Drayton, 3 October 2019. https://www.barbers-auctions.co.uk/sites/default/files/event_pdf_files/MARK.SHEEP%20FAIR%20%28SECOND%29%20CATALOGUE%2003.10.19.pdf

Wiltshire

Wilton Sheep Fair at Salisbury Market:

- Sheep, Wilton, 8 August 2019. http://www.salisburyauctioncentre.co.uk/southern-counties-auctioneers/sales/wilton-sheep-fair/wilton-sheep-fair-12/Cat08082019.pdf
- Sheep, Wilton Breeders, 12 September 2019. http://www.salisburyauctioncentre.co.uk/southern-counties-auctioneers/sales/wilton-sheep-fair/wilton-sheep-fair-12/Cat08082019.pdf
- Sheep, Wilton, 12 September 2019. http://www.salisburyauctioncentre.co.uk/southern-counties-auctioneers/sales/wilton-sheep-fair/wilton-sheep-fair-13/Cat12092019.pdf

Appendix 4. Calculating relative FTE

For the purpose of evaluating the capacity of a farm's workforce to respond to pressures, and given the findings from the literature review on the potential for labour surpluses or over-work in agriculture, it is useful to consider if the farm's workforce is larger or smaller than average. This Appendix describes the method that was developed to compare each surveyed farm's workforce, in estimated FTE, relative to other farms within the survey.

A4.1. Controlling for size effect

The method needed to control for the farm's size so that it could compare the workforce capacity of farms of a similar size to one another. This was necessary because the physical scale of the farm operation is a determinant of the size of a farm's workforce. The FTE per farm of farms in the survey is significantly positively associated with their farmed area (p=0.000), such that workforce tends to increase with size (Table A4.1). There is a size effect even within farm type groupings, although the association between farmed area and FTE is not perfectly linear. The estimated FTE of dairy farms, lowland farms and so on is consistently larger on farms of at least 200ha than farms under 100ha, for example.

Table A4.1. Estimated FTE per farm of surveyed farms, by type and area farmed
Data source: survey dataset

	Average FTE per farm (estimated)					
	Under 20ha	20 to under 50ha	50 to under 100ha	100 to under 200ha	200ha and over	Unknown
(a) Farm type						
Dairy	None	None	2.8	4.2	9.0	6.5
LFA	1.4	2.4	1.9	2.5	3.0	None
Lowland	1.3	1.5	2.1	2.1	4.2	None
Mixed	None	0.8	2.3	3.1	3.7	1.8
Smallholding	1.0	None	None	None	None	None
(b) Enterprise grouping						
Dairy only	None	None	2.8	4.8	8.7	11.0
Beef and/or sheep only	1.1	1.7	2.0	2.3	3.5	None
Dairy and beef and/or sheep	None	None	3.3	3.9	7.0	None
Dairy, mixed enterprise(s) and maybe also beef and/or sheep	None	None	2.3	4.0	9.7	2.0
Beef and/or sheep plus mixed enterprise(s)	0.9	0.8	2.3	3.1	3.7	1.8

To control for size, it might have been possible to use FTE per 100ha, which is inversely related to farmed area. However, FTE per 100ha skews positively towards small farms (Lund & Price 1998). While small farms tend to have an absolutely smaller workforce than large farms, they tend to have a disproportionally larger workforce per hectare (Table A4.2). For this reason, although it was necessary to find a way to standardise the farm data for comparison, it was not appropriate to calculate each farm's FTE per 100ha and compare farms on this measure. The aim was to compare the capacity of farm workforces among surveyed farms *of a similar size*, therefore a method which somewhat controls for the size effect was required.

Table A4.2. Estimated FTE per 100ha of surveyed farms, by type and area farmed
Data source: survey dataset

	Average FTE per 100ha (estimated)					
	Under 20ha	20 to under 50ha	50 to under 100ha	100 to under 200ha	200ha and over	Unknown
(a) Farm type						
Dairy	None	None	4.1	2.9	2.6	None
LFA	8.8	8.3	2.6	1.9	1.2	None
Lowland	9.2	4.9	3.3	1.6	0.7	None
Mixed	None	2.3	3.0	2.1	1.1	None
Smallholding	17.4	None	None	None	None	None
(b) Enterprise grouping						
Dairy only	None	None	4.1	3.1	2.6	None
Beef and/or sheep only	13.7	5.5	2.9	1.8	1.0	None
Dairy and beef and/or sheep	None	None	4.9	2.7	2.9	None
Dairy, mixed enterprise(s) and maybe also beef and/or sheep	None	None	2.8	2.8	2.6	None
Beef and/or sheep plus mixed enterprise(s)	20.3	2.3	3.0	2.1	1.1	None

A4.2. Trial method: relative comparison using interpolation

A method was developed which would compare each surveyed farm's FTE against a prediction of what its FTE would be, based on interpolation of the available data.

To do this, the estimated FTE per farm was plotted against farmed area. This revealed a roughly linear correlation, although the increase in FTE tails off once farms get to 500ha or so (Figure A4.1).

The data were then interpolated, to produce a theoretical FTE for a farm of any size. The interpolation was done in Microsoft Excel using the FORECAST function (Excel Off The Grid, 2020). This models an imperfectly linear relationship, which seemed to fit the data best. FORECAST predicted an FTE value for each farm based on its farming enterprise grouping. For example, the interpolation predicted that a specialist dairy farm of 80ha would have an FTE of 4.82.

Next, it was calculated for each surveyed farm if its estimated FTE was above or below the interpolated value, measured as a percentage. For example, Farm A's estimated FTE was 75% of the interpolated FTE for its enterprise grouping. The farms were split into three groups: 'Low', 'Similar' and 'High'. The farms designated as 'Low' had an estimated FTE which was at least 10 percentage points less than the estimated-FTE-to-interpolated-FTE percentage. With the 'High' farms, their estimated FTE was at least 10 percentage points higher than the median percentage. And the 'Similar' farms had an estimated FTE within 10 percentage points either side of the median percentage. This gave a distribution of roughly 40% Low farms, 20% Similar farms and 40% High farms.

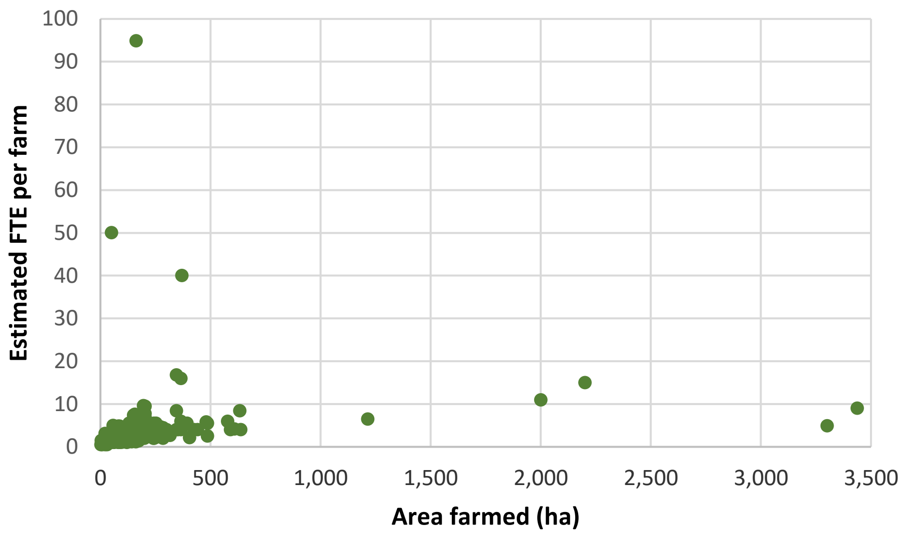


Figure A4.1. Distribution of estimated FTE by area farmed of surveyed farms (*n*=212)
Data source: survey dataset

This interpolation method was limited, because several farms in the survey had to be excluded owing anomalous or missing data. Additionally, using interpolation meant that the results could only be predictive.

A4.3. Preferred method: relative comparison with average for size grouping

An alternative method was therefore developed. This second method compares each farm's estimated FTE with the average estimated FTE per farm for its size grouping. Rather than use interpolation along a continuous range, the farms were grouped into standard size groupings used by Defra: under 20ha, 20-50ha, 50-100ha, 100-200ha and over 200ha. Although these groupings are not equally spaced, they fit the distribution of number of cases quite nicely. Next, the median estimated FTE per farm was calculated for each size grouping, subdivided by farming enterprise grouping (e.g. median FTE for livestock-only farms of 50-100ha). Then each farm's estimated FTE was compared with the median for its type and size grouping. If the estimated FTE was smaller than the median FTE by at least 10 percentage points, the farm was classified as 'Low'. If the estimate FTE was at least percentage points greater, the farm was classified as 'High', and farms in the middle were classified as 'Similar'.

The results from the two methods were compared. Most farms have the same classification from both methods, but in 26 cases, the farm's classification differed. For example, a farm is classified as 'Low' by the interpolation method but 'Similar' by the size grouping method.

The disadvantage of using an average FTE for an entire size grouping rather than a precise interpolated value for the farm's actual size, is that it introduces some variation attributable to the size effect. However, it avoids using interpolation, which can only ever be predictive. Another advantage of this method is that the very large farms over 1,000 ha could be included, whereas they were excluded from the previous interpolation method.

It was therefore decided to use this second method for measuring a farm's relative FTE. It was used as a measure for each of the interviewees' farms, to see if there was a relationship between a farm's relative FTE and its ‘stretchedness’. The assumption was that a farm with a low relative FTE had a smaller workforce than other farms of a similar size, and therefore could be at risk of a labour shortfall and becoming stretched. Conversely, a farm with a high relative FTE had a larger workforce than other farms of a similar size, and could be assumed to have more labour-input available, and possibly even a labour surplus, which could guard against the farm workforce becoming stretched.

Table A4.3 presents the results. Note that only 14% of the relaxed interviewees had a low relative FTE, compared with 29% of the stretched type 1 interviewees and 60% of the stretched type 2 interviewees.

Table A4.3. Results for considering relative FTE as a risk factor for stretchedness
Data source: survey dataset and telephone interviews

	Relative FTE (number of cases)				Relative FTE (% of cases)			
	Low	Similar	High	Not available	Low	Similar	High	Not available
Interviewed farms:								
Stretched type 1	2	3	2	0	29	43	29	0
Stretched type 2	3	0	1	1	60	0	20	20
Relaxed	1	2	3	1	14	29	43	14
Neither	7	4	4	0	47	27	27	0
All interviewees	13	9	10	2	38	26	29	6
All surveyed farms	77	50	85	18	33	22	37	8

Appendix 5. Overview of June Survey, Farm Business Survey and Defra types

Table A5.1. Overview of June Agricultural Survey for England

June Survey of Agriculture and Horticulture, England ('June Survey')	
Conducted by	Defra Surveys Team
Rationale	Compulsory under Agricultural Statistics Act 1979 and EU legislation
Coverage	England
Sampling	Random stratified sampling of 30,000-70,000 holdings unless a full census year; response rate of 73% in 2011. Results imputed to whole population
How respondents are identified	Cattle Tracing System (CTS), Sheep and Goat Inventory, and Single Payment Scheme data
Threshold	Excludes smallest 40% of holdings. These are defined as *non-commercial holdings*. Threshold is based on hectarage or heads of livestock, including ≤5 ha utilised agricultural area, ≤20 sheep and ≤10 cattle.
Frequency	Conducted annually every 1 June; results published every September. Most recent year available is 2018
County-level data	Not available for every year. Most recent year available is 2016
Unit of analysis	*Commercial holding*, defined as: "A single unit, both technically and economically, which has a single management and which undertakes agricultural activities … either as its primary or secondary activity" (Defra 2016). A commercial holding may have more than one enterprise (e.g. mixed holding).Non-commercial holdings are excluded by the threshold.
Classification	Standard farm types, classified using standard output of farm enterprises
Sources	https://www.gov.uk/guidance/structure-of-the-agricultural-industry-survey-notes-and-guidance#june-survey-of-agriculture-and-horticulture-in-england https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/182206/defra-stats-foodfarm-landuselivestock-june-junemethodology-20120126.pdf

Table A5.2. Overview of June Agricultural Survey for Wales

June Survey of Agriculture and Horticulture, Wales ('June Survey' or 'Welsh agricultural survey)	
Conducted by	Welsh Government
Rationale	Compulsory under Agricultural Statistics Act 1979 and EU legislation
Coverage	Wales
Sampling	Random stratified sampling unless a full census year; response rate of 36% from 11,000 sample in 2019. Results imputed to whole population
How respondents are identified	Cattle Tracing System (CTS) and other registers. No compulsory register of farms is available for Wales (or for England)
Threshold	Farm size is measured in European Size Unit (ESU), a measure of economic turnover. All holdings with an ESU > 0 is sampled, although farms with a small ESU are sampled at a lower rate than farms with a large ESU
Frequency	Conducted annually every 1 June; results published every September. Most recent year available is 2019
County-level data	Not available for every year. Most recent year available is 2017 for regions (Powys is both county and region)
Unit of analysis	*Farm*. This seems to be used interchangeably with 'holding', which has the same definition as in England, although all holdings, not just 'commercial holdings', are included (Defra 2016).

Classification	Robust farm types, almost identical to England robust farm types.
Sources	https://statswales.gov.wales/Catalogue/Agriculture/Agricultural-Survey https://gov.wales/sites/default/files/statistics-and-research/2019-11/survey-agriculture-and-horticulture-june-2019-730.pdf https://statswales.gov.wales/Catalogue/Agriculture/Agricultural-Survey/Farm-Types/robust-farm-type-by-area

Table A5.3. Overview of Farm Business Survey

Farm Business Survey (FBS)	
Conducted by	University research centres on behalf of Defra (England); Welsh Government (Wales)
Rationale	Required under EU legislation relating to the Farm Accountancy Data Network ((EC) No 1217/2009)
Coverage	England and Wales
Sampling	Over 2,300 farm businesses in England and Wales surveyed each year. Stratified by farm type, farm size and regional location. Panel sampling, so that farms are retained in the survey year after year
How respondents are identified	From June Survey
Threshold	Excludes farms with standard output <Eu 25,000
Frequency	Annual
County-level data	Available for county groupings (e.g. Shropshire and Staffordshire)
Unit of analysis	*Farm business*. Not defined. This seems to be used interchangeably with 'farm'. A farm business may have more than one holding; the number of holdings per farm is provided.
Classification	Robust farm types used by Defra
Sources	http://www.farmbusinesssurvey.co.uk/ https://www.gov.uk/guidance/farm-business-survey-technical-notes-and-guidance https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/557605/fbs-definintions-4oct16.pdf https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/557607/fbs-statisticalinformation-4oct16.pdf

Table A5.4. Definitions of Defra farm types
Source: Defra (2012)

Farm type and relevant sub-groups	Definition	Must have cattle or sheep?
Cereals	Cereals and other crops generally found in cereal rotations (e.g. oilseeds, peas and beans harvested dry and land set-aside) account for more than two thirds of the total SO	No, but may have cattle or sheep if they account for <one third total SO
General cropping	Arable crops (including field scale vegetables) account for more than two thirds of the total SO OR A mixture of arable and horticultural crops account for more than two thirds of the total SO. OR Holdings without livestock that also have grassland and forage crops accounting for more than two thirds of the total SO	No, but may have cattle or sheep if they account for <one third total SO
Horticulture	Fruit (including vineyards), hardy nursery stock, specialist mushrooms, glasshouse flowers and vegetables, market-garden-scale vegetables and outdoor bulbs and flowers account for more than two thirds of the total SO.	No, but may have cattle or sheep if they account for < one third total SO
Specialist pigs	Pigs account for more than two thirds of the total SO	No, but may have cattle or sheep if they account for < one third total SO
Specialist poultry	Poultry account for more than two thirds of the total SO	No, but may have cattle or sheep if they account for < one third total SO
Dairy Dairy (LFA) Dairy (lowland)	Dairy cattle account for more than two thirds of the total SO. Dairy holdings inside "Less Favoured Areas" (LFA) are included within this group.	Yes. Must have dairy cattle. May also have beef cattle or sheep
LFA grazing livestock[a] Specialist sheep (SDA) Specialist beef (SDA) Mixed grazing livestock (SDA) Various grazing livestock (DA)	Grazing livestock account for more than two thirds of the total SO. A holding is classified as being in the LFA if 50% or more of its total area is in the LFA.	No. May have horses, goats or deer (England)
Lowland grazing livestock[b] Various grazing livestock (lowland)	Grazing livestock account for more than two thirds of the total SO (excludes holdings classified as dairy). OR Holdings with grazing livestock that also have grassland and forage crops accounting for more than two thirds of the total SO. A holding is classified as lowland if less than 50% of its total area is in the LFA.	No. May have horses, goats or deer (England)
Mixed Cropping and dairy Cropping, cattle and sheep Cropping, pigs and poultry Cropping and mixed livestock Mixed livestock Specialist grass and forage	Neither crops nor livestock are the predominant activity. For these holdings the dominant activity will usually account for between one third and two thirds of the total SO.	No, but may have cattle or sheep if they account for < one third total SO

[a] Equivalent robust category in Wales is 'Cattle and sheep (LFA)', with sub-groups 'Cattle and sheep (SDA)' and 'Cattle and sheep (DA)'. No other animals.
[b] Equivalent robust category in Wales is 'Cattle and sheep (lowland)'. No other animals.

Appendix 6. New Zealand's experience of agricultural subsidy removal

Following the UK's departure from the European Union and the decision to end the Basic Payment System, livestock farmers in England and Wales face a future without a direct form of income subsidy. This Appendix describes how livestock farmers in New Zealand dealt with a similar loss of subsidies in the 1980s. It is interesting to observe the impacts on their farm labour systems, albeit at a different time and place.

In 1984/5, the political decision was taken to radically liberalise New Zealand's agriculture sector, which included tens of thousands of sheep, beef and dairy farmers. Within a short space of time, the state removed a host of support measures, including: guaranteed minimum prices for lamb, beef, wool and dairy products; tax deferrals for farms that increased livestock numbers; fertiliser subsidies; and the free provision of farm advisory and inspection services (Tyler & Lattimore, 1990). It was also decided to raise state-backed loans from concessionary to market rates (ibid.). Owing to these policy reforms, and macro-economic factors, New Zealand's farmers faced a rapid drop in income coupled with a dramatic increase in loan repayments. A rural debt crisis was triggered (Johnston & Sandrey, 1990); alongside a crisis in mental health, with many cases of farmer depression and suicide reported (Wallace, 2014). The market and policy changes were exacerbated by serious droughts in 1988/9 (ibid.).

The way in which New Zealand's farmers responded had several impacts on farm labour and employment. It became a burning priority to cut costs. One area where farmers made savings was paid employment. From 1984, there was a steady decline in permanent labour in agriculture, and an increase in casual and unpaid family labour (Savage, 1990). Farmers also reduced their use of contractors, aiming to do more tasks themselves. There are records of farmers collaborating more – grouping together for sheep shearing, for example, or using a neighbour's shed rather than investing in a new one (Wallace, 2014). Low-priority jobs such as fencing, building repair or machinery maintenance were postponed (ibid.).

Many farmers diversified and/or downsized their livestock production systems – by reducing their flocks, fattening dairy cattle for beef rather than rearing them for milk production, diversifying into farmed deer or goats, or letting out land for cereals or horticulture (Reynolds & SriRamaratnam, 1990; Wallace, 2014). It also became common for farmers (assumed at that time to be men) and farmers' wives to seek off-farm employment. One consequence of the crisis was a change in gender relations. Rural women became more empowered, as they gained their own sources of income and took on more work and decision-making on the farm (Wallace, 2014). Small part-time farms whose owners had off-farm income may have been able to weather the storm better than larger full-time operations (Savage, 1990). At the same time, the hundreds of farmers who were forced to sell up or persuaded to retire led to the establishment of some very large, consolidated operations. Workers were replaced by technology; farming overall became more capital-intensive (Reynolds & SriRamaratnam, 1990).

There are some parallels and differences with the UK today. Farmer indebtedness was a huge problem in New Zealand, facilitated by a concessionary loan system which does not have an equivalent in the UK. In 1982/3, interest payments accounted for 14% of gross income among New Zealand's farms, on average, and this rose to 20% by 1987/8 after liberalisation (Reynolds & SriRamaratnam, 1990). Indebtedness is also an issue in current-day UK. In 2017/18, interest payments represented 11% of farm business income in England, with an average farm debt of £234,400 (including £434,900 for dairy farms, £104,300 for lowland grazing livestock farms and £95,100 for LFA grazing livestock farms)(Defra, 2020a). The UK's farmers are not, perhaps, likely to face the exceptional increase in interest rates that occurred in New

Zealand. But they may have fewer labour options for responding to loss of the BPS and any other negative financial consequences of Brexit. New Zealand's sector was probably over-subsidised, and there was fat to trim (Wallace, 2014). In present-day UK, farming systems have already become leaner because of policy reforms such as the end to headage payments and the abolition of marketing boards, and the backdrop of falling farm returns (The Prince's Countryside Fund, 2016). As we have seen, they have also gone through a transition of outsourcing work done by permanent waged workers to agricultural contractors. That is, the UK's farm labour systems have already adjusted more than New Zealand's farms had in the early 1980s. Thus, some of the labour-related responses made in New Zealand, such as labour casualisation, reducing contractors, working longer hours or wives entering the job market, might not be available to as many UK livestock farmers today. However, it will be interesting to see if any of these responses do occur. It is also interesting that droughts exacerbated the crisis in New Zealand and made it harder for cash-strapped farmers to survive. Today, impacts of climate change such as floods or summer drought threaten to make things more difficult for UK farmers in a similar way (Garry et al., 2021).

Appendix 7. Livestock farming production systems in the UK

This Appendix provides the reader with background information on production systems followed by dairy, lowland grazing and upland grazing farms in the UK, beginning with dairy enterprises.

The heart of a dairy herd is lactating dairy cows. They are usually milked twice a day in a parlour, which would typically have stalls set out in a parallel or herringbone pattern, or a circular rotary platform (Allen, 2017). Dairy cows that are rested from milking are known as dry cows. Dairy farms may rear youngstock as followers, which will replenish the herd (FarmWeb.co.uk, 2020). Other calves are sold to beef producers to be grown and finished for meat. However, in 2016 it was estimated that one in five male dairy calves were shot after birth, because of the costs of rearing and insufficient market demand for dairy-bred beef (Henderson, 2020).

There are three main lifestages for beef cattle: rearing, growing and finishing. Calving tends to happen in spring or autumn. Increasingly, farmers are concentrating this process into calving blocks, with calving intervals that fit into the seasonal pattern and an emphasis on easy calving (Horn et al., 2016). Dairy farms still tend to calve year-round, although low-input dairy systems with seasonal grazing might use seasonal or block calving to coincide with grass availability (ibid). In extensive suckler systems, beef calves are kept with their mothers (dams) to suckle for 7–10 months. After weaning, calves and youngstock may be grown as stores for around 6 months. Finally comes a finishing period of weight gain before slaughter, which lasts from 7 to 10 months or more. Intensive finishing systems tend to house cattle indoors and use large quantities of cereals, silage or feed; suckler-bred cattle are typically grazed outdoors and may take longer to finish (Hybu Cig Cymru [Meat Promotion Wales], 2014; AHDB, 2017; Redman, 2017; NFU, n.d.). Many beef producers specialise in one or more lifestages rather than take animals from calving to slaughter (AHDB, 2017). Specialisation supports a market in store cattle and requires coordination between producers and finishers (NFU, n.d.).

In sheep systems, lambing typically takes place between February and April. Lambing can take place indoors or, if the breed is hardy and the climate mild, outdoors. Female (ewe) lambs may be kept for 12 months for breeding. Lambs can be kept as stores before finishing. As with beef finishing, some producers specialise in buying and finishing store lambs (Short & Dwyer, 2012; QMS, 2013; Redman, 2017).

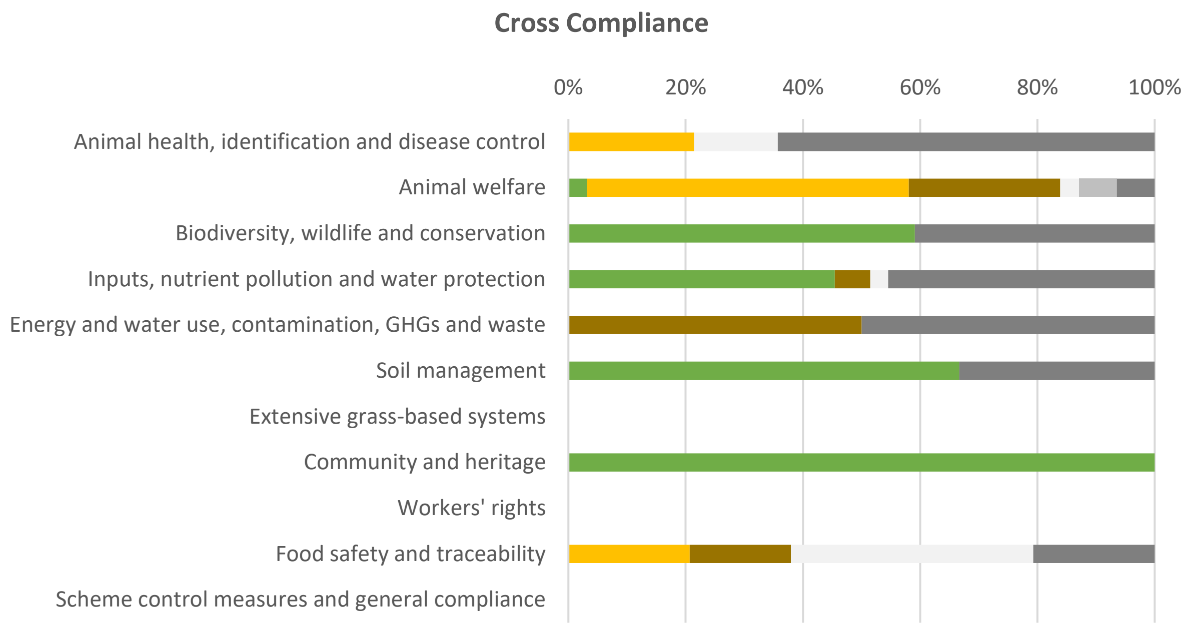
Many beef and sheep enterprises, and a small number of dairy enterprises, are in uplands where the land is not well suited to arable production. Upland farms may have permanent grassland, upland meadows and rough grazing of limited quality. Lowland farms are more likely to have semi-permanent grassland which is re-seeded every few years or to cultivate temporary pasture as a short-term ley in rotation with arable crops. Beef suckler herds are associated, although not exclusively so, with uplands (Short & Dwyer, 2012). According to the NFU, 40% of cattle in England are on upland farms (NFU, n.d.).The UK has the 'stratification system', where hill farmers breed hardy draft ewes, which are then brought down for breeding with rams to produce cross-bred lambs which are less hardy but more suitable for meat production, to be finished on upland or lowland farms (NFU & NFU Cymru, 2019; FarmWeb.co.uk, 2020). Similarly, while hardy cows and stores could be out-wintered in the uplands, suckler calves were traditionally brought down from the hills in winter so that they could be grazed on land lower down the valley, perhaps on dairy farms while the dairy herd was being housed indoors, for eventual sale or breeding (Short & Dwyer, 2012).

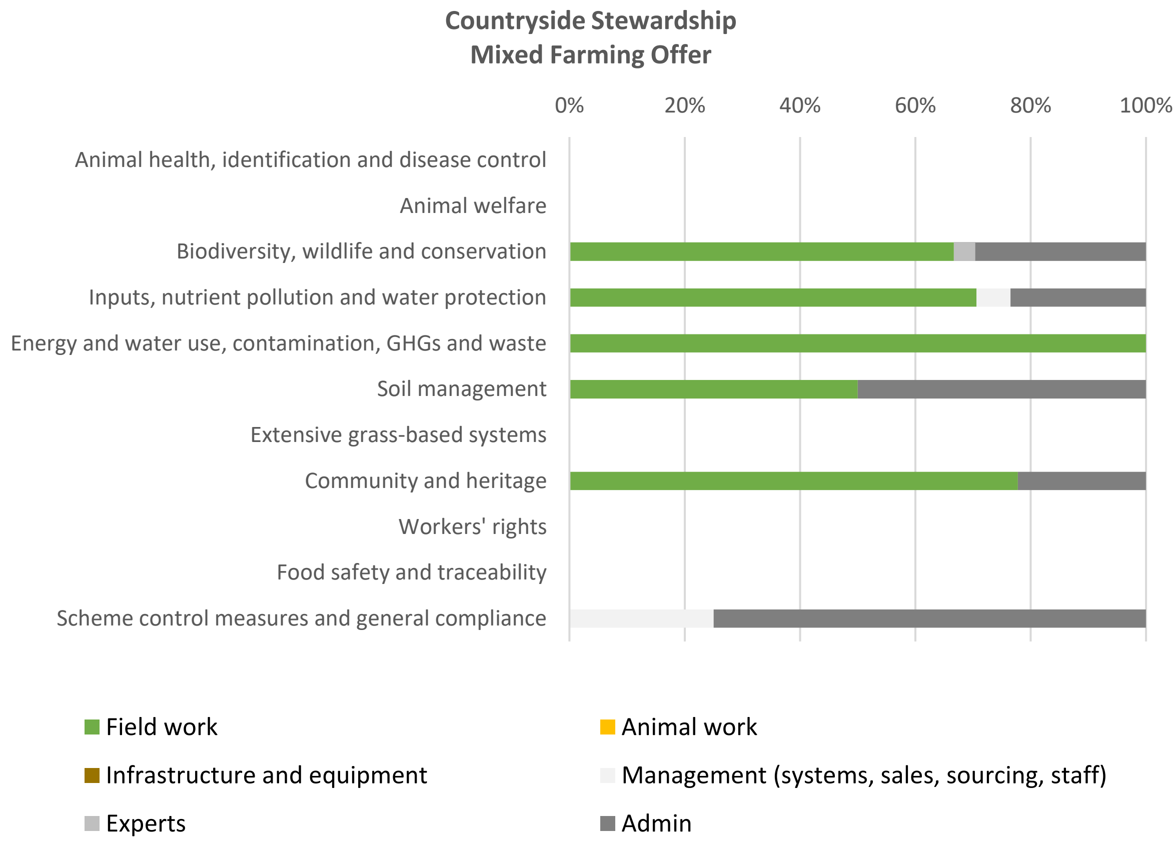
Some livestock farmers keep a closed herd or closed flock, where they breed replacements themselves rather than purchasing animals from another producer (FarmWeb.co.u,k 2020). This helps biosecurity (disease prevention) and is encouraged in organic systems.

Land use in livestock farming can be fluid and fragmented. As well as keeping livestock on their own land, of which they may be tenants or owner-occupiers, many farmers rent additional parcels of grazing land on a seasonal or longer-term basis, with a grazing licence (Freeths, 2016). The UK still has commons land, to which livestock keepers claim grazing rights (GOV.UK, 2019a). Increasingly, livestock farmers are encouraged to enter into agreements with arable farmers to graze their animals on cover crops or cereal stubble as part of an arable rotation (AHDB, 2018c; Sagoo et al., 2018). Some livestock keepers known as graziers own flying herds or flocks which they graze on someone else's land. Graziers are often contracted by wildlife trusts to undertake conservation grazing on reserve land (e.g. Heritage Graziers, 2019; Moor Meadows, 2019).

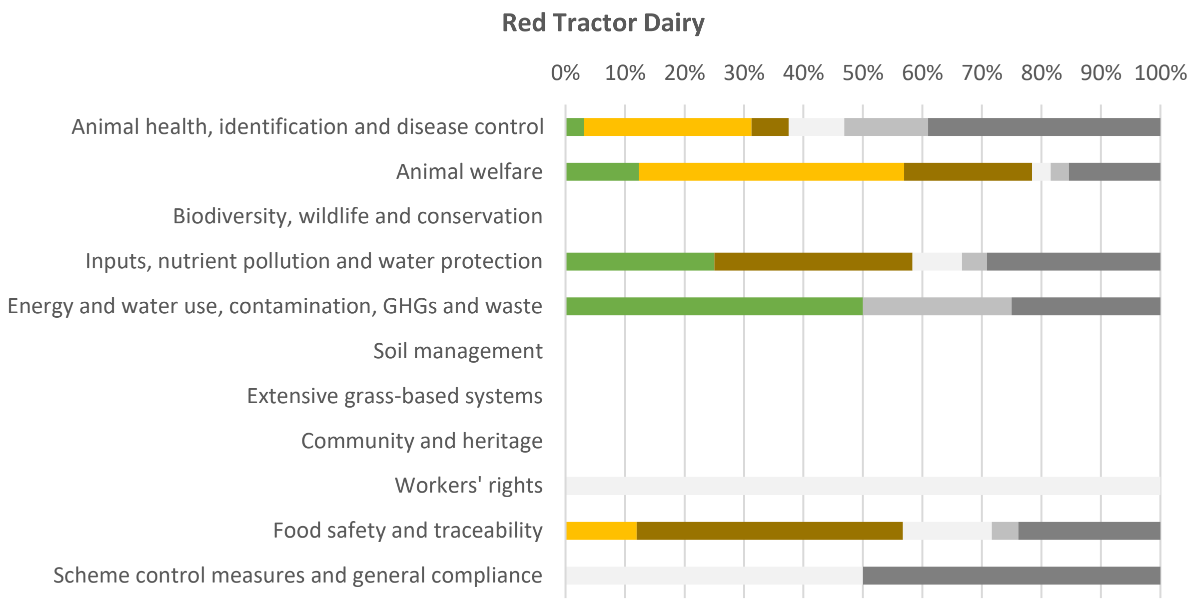
Appendix 8. Breakdown of activities in requirement schemes

The following charts present a breakdown of the individual requirements in selected requirement schemes. It shows which topics its requirements cover and how the requirements in each topic break down by type of activity required.

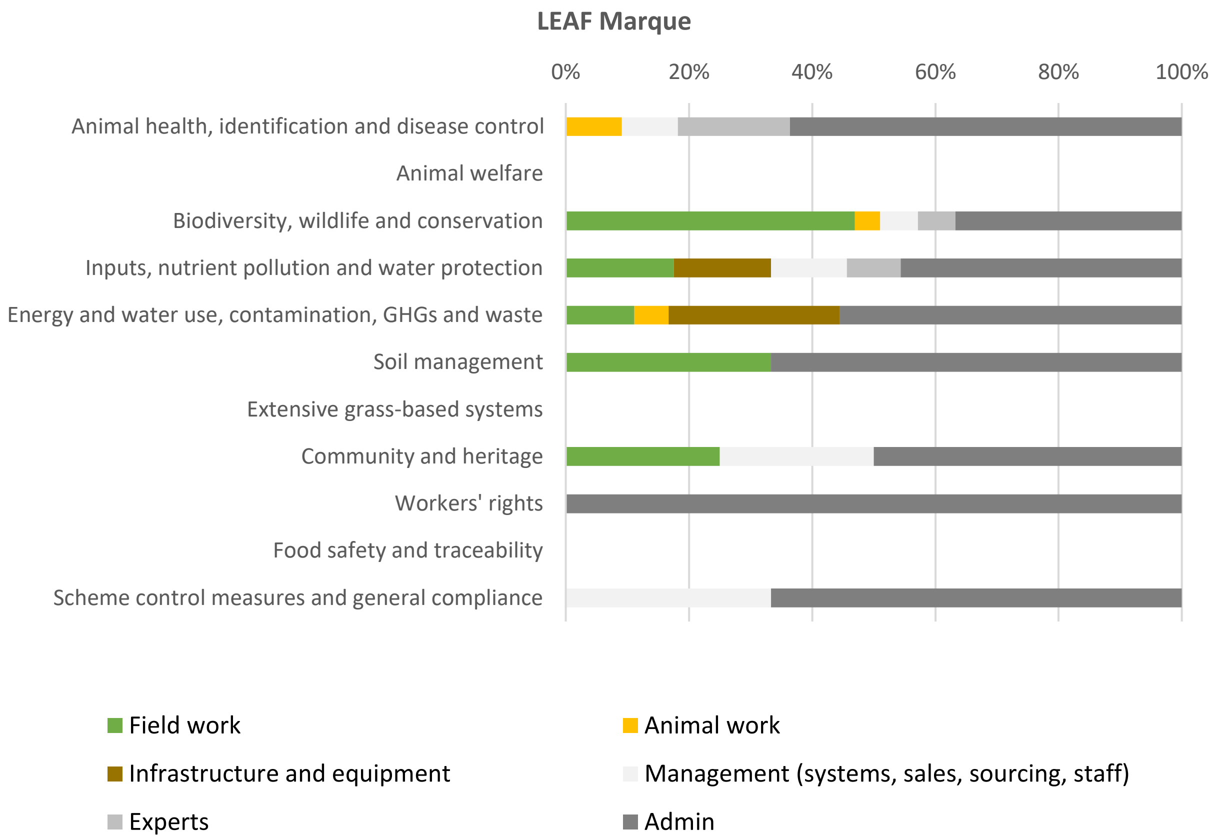




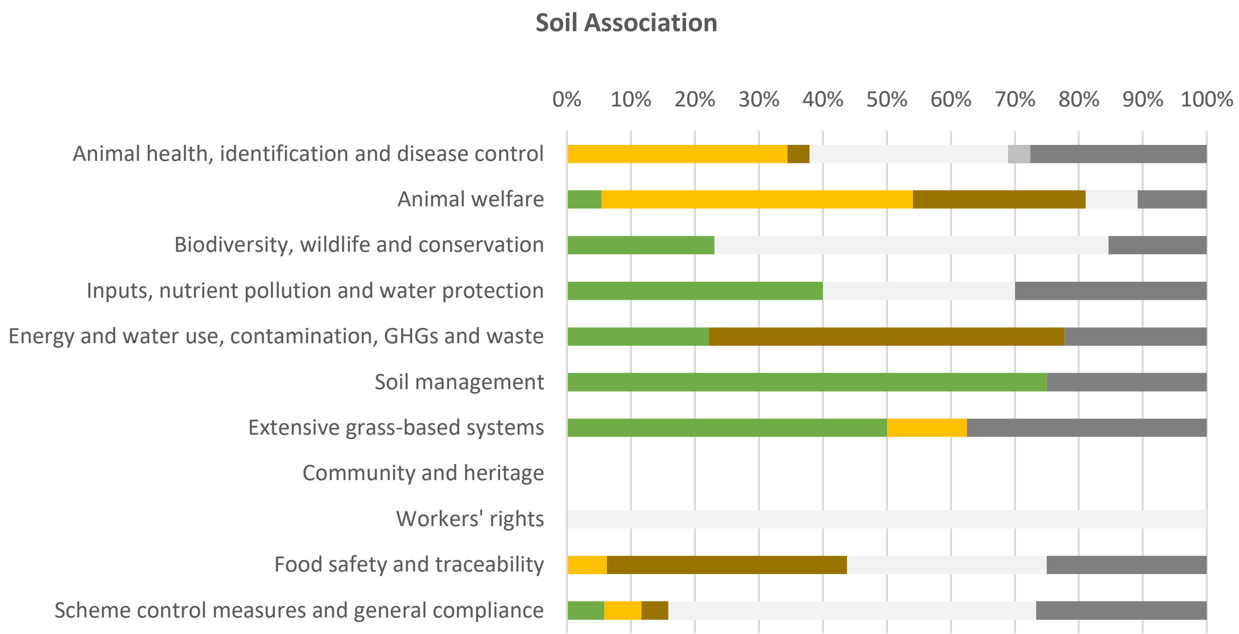

Countryside Stewardship
Upland Offer
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance
Red Tractor Beef and Lamb
0%
20%
40%
60%
80%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance
Field work
Animal work
Infrastructure and equipment
Management (systems, sales, sourcing, staff)
Experts
Admin

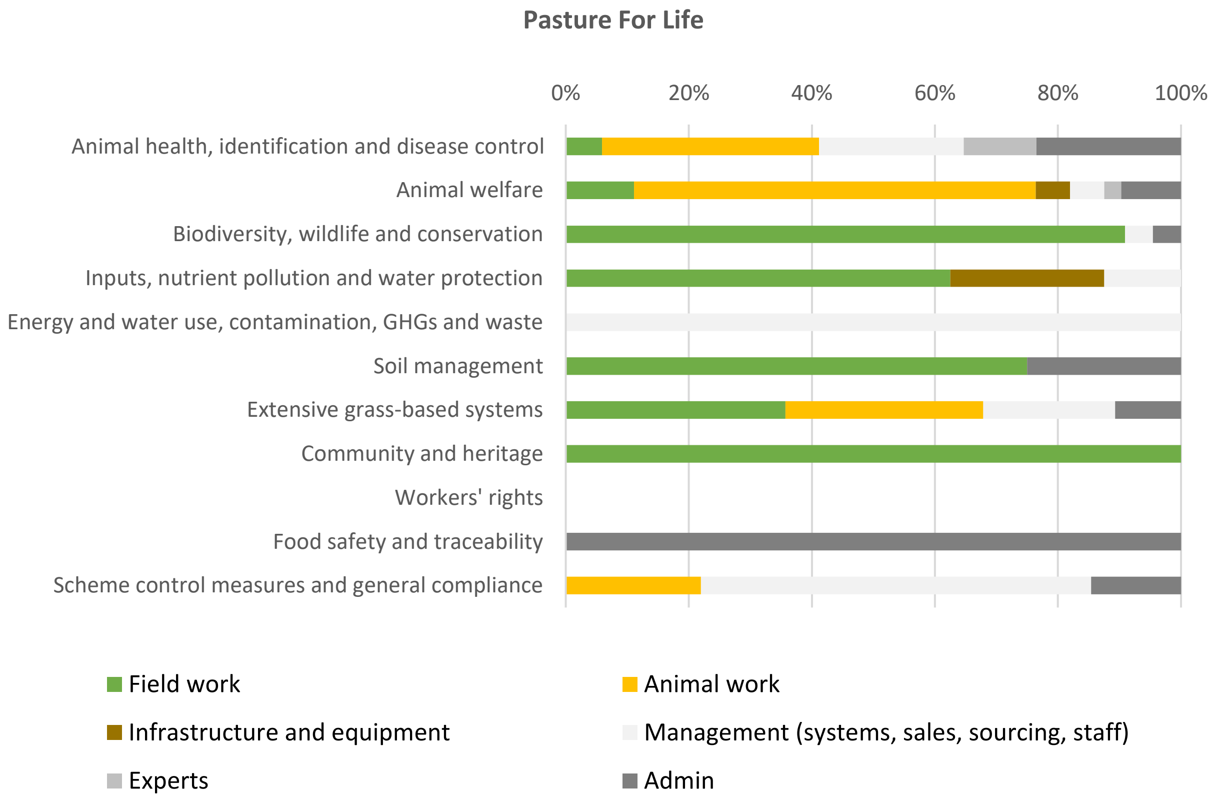


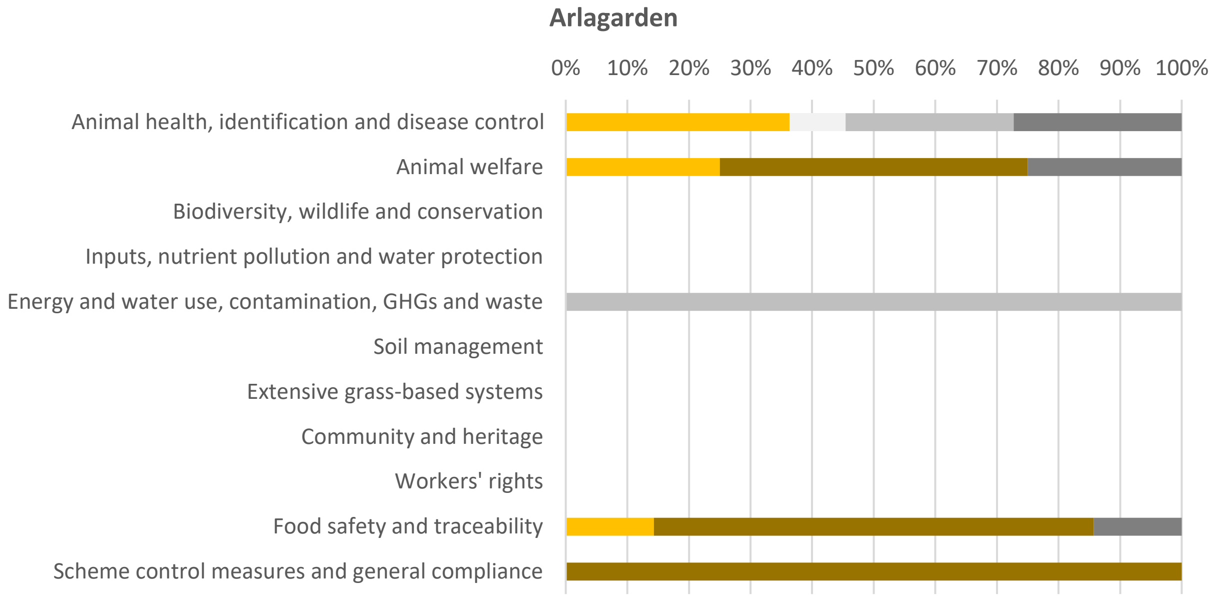
Red Tractor Dairy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance

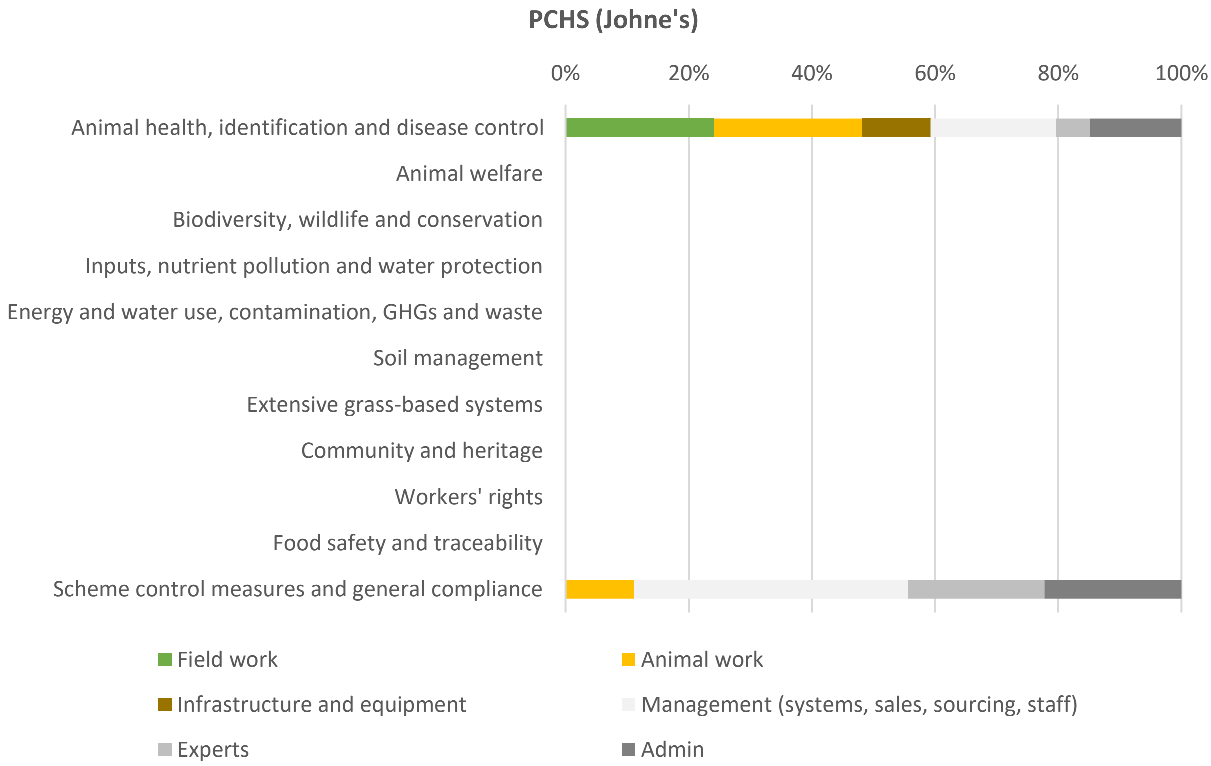


LEAF Marque
0%
20%
40%
60%
80%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance
Field work
Animal work
Infrastructure and equipment
Management (systems, sales, sourcing, staff)
Experts
Admin


Soil Association
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance


Pasture For Life
0%
20%
40%
60%
80%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance
Field work
Animal work
Infrastructure and equipment
Management (systems, sales, sourcing, staff)
Experts
Admin


Arlagarden
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance


PCHS (Johne's)
0%
20%
40%
60%
80%
100%
Animal health, identification and disease control
Animal welfare
Biodiversity, wildlife and conservation
Inputs, nutrient pollution and water protection
Energy and water use, contamination, GHGs and waste
Soil management
Extensive grass-based systems
Community and heritage
Workers' rights
Food safety and traceability
Scheme control measures and general compliance
Field work
Animal work
Infrastructure and equipment
Management (systems, sales, sourcing, staff)
Experts
Admin

Appendix 9. Scheme and supermarket requirements

According to the analysis presented in Chapter 5, the most common requirements of third-party schemes and supermarkets that go beyond Red Tractor and legislative requirements are as follows:

Animal work:

- No prophylactic use of antibiotics, no colistin or no Critically Important Antibiotics at all; use of antibiotics must be under veterinary supervision
- Find alternatives to anthelmintic drenches and boluses, especially Avermectin
- Measures to prevent euthanasia of dairy bull calves
- No cloning or genetic engineering
- No tethering or close confinement, and specified maximum housing densities
- Environmental enrichment for housed animals
- No electric prods
- Stricter rules on mutilation procedures and no dehorning or tail docking of cattle

Field work:

- Plant and manage hedges, protect field margins and promote sward diversity
- Dairy cattle must graze outdoors, sometimes with specific targets (e.g. 100 days/year, Marks & Spencer; 120 days/year, Morrisons)
- Other grazing- and diet-related requirements for pasture-based systems

Management systems and administrative work:

- Have a livestock health plan which is developed with a vet, not just for dairy cattle but also for beef cattle and sheep
- Include BVD and/or Johne's disease prevention in the plan, again not just for dairy cattle
- Soil monitoring and testing
- Measure and reduce energy use, carbon footprint and greenhouse gas emissions
- General monitoring and reporting, especially livestock indicators for supermarkets and environmental indicators for LEAF Marque
- Keep a complaints record
- Have control systems to ensure compliance with the particular system

Appendix 10. Summaries of survey responses by topic

Table A10.1. Summary of survey responses on production systems

Data source: survey dataset

Survey question or derived variable	Response	Average or percentage (number) of responses
Farming enterprises	Dairy	25% (58/230)
	Beef	70% (161/230)
	Sheep	65% (150/230)
	Arable[a]	36% (82/230)
	Field-scale vegetables	1% (2/230)
	Horticulture and orchards	7% (17/230)
	Pigs	3% (6/230)
	Poultry	4% (10/230)
Number of farming enterprises	/	Average 2.11(*n*=230)
Single or multiple farming enterprise	Single farming enterprise	27% (61/230)
	Multiple farming enterprises	73% (169/230)
Eco-extensive[b]	Yes	18% (42/230)
	No	82% (188/230)
Feeding: dairy cattle	Unrestricted grazing in a single area. (Set stocking)	11% (6/56)
	Rotational grazing between fields	50% (28/56)
	Intensive rotational grazing on paddocks. (Strip grazing, mob grazing, AMP)	54% (30/56)
	Zero grazing, but we produce forage for housed animals. (Cut and carry)	11% (6/56)
	Zero grazing, and no grass forage is produced on the farm. (Landless system)	2% (1/56)
Feeding: beef cattle	Unrestricted grazing in a single area. (Set stocking)	29% (44/152)
	Rotational grazing between fields	76% (115/152)
	Intensive rotational grazing on paddocks. (Strip grazing, mob grazing, AMP)	6% (9/152)
	Zero grazing, but we produce forage for housed animals. (Cut and carry)	1% (1/152)
	Zero grazing, and no grass forage is produced on the farm. (Landless system)	1% (1/152)
Feeding: sheep	Unrestricted grazing in a single area. (Set stocking)	28% (41/147)
	Rotational grazing between fields	79% (116/147)
	Intensive rotational grazing on paddocks. (Strip grazing, mob grazing, AMP)	6% (9/147)
	Zero grazing, but we produce forage for housed animals. (Cut and carry)	0% (0/147)
	Zero grazing, and no grass forage is produced on the farm. (Landless system)	0% (0/147)
Housing: dairy cattle	Year-round outdoor grazing	89% (50/56)
	Outdoor grazing with winter housing	2% (1/56)
	Year-round indoor housing	16% (9/56)
Housing: beef cattle	Year-round outdoor grazing	9% (14/159)
	Outdoor grazing with winter housing	88% (140/159)
	Year-round indoor housing	6% (9/159)
Housing: sheep	Year-round outdoor grazing	55% (81/148)
	Outdoor grazing with winter housing	49% (73/148)

	Year-round indoor housing	0% (0/148)
Calving (dairy and/or beef)	All-year-round calving	45% (75/168)
	Block calving once a year	31% (52/168)
	Block calving twice a year	24% (40/168)
	Combination block and all-year-round calving	1% (1/168)
Lambing	Indoor lambing once a year	61% (86/140)
	Indoor lambing more than once a year	6% (8/140)
	Outdoor lambing once a year	19% (26/140)
	Outdoor lambing more than once a year	1% (2/140)
	Combination indoor and outdoor lambing once a year	13% (18/140)
Milking	Milking once a day	0% (0/56)
	Milking two times or more a day	95% (53/56)
	Robotic milking (AMS)	4% (2/56)
	No milking (contracted out)	2% (1/56)

Note: percentages may total more than 100% for questions where respondents could select more than one answer.
[a] Does not include some farmers who grow forage crops but did not tick Arable in the questionnaire.
[b] Based on participation in organic, Pasture For Life or Free Range Dairy schemes.

Table A10.2. Summary of survey responses on marketing and diversification

Survey question or derived variable	**Response**	**Percentage (number) of responses**
Do you have a diversification business?	Yes	34% (78/228)
	No	66% (150/228)
Do you do agricultural contracting for others?	Yes	25% (57/230)
	No	75% (173/230)
Marketing channels: dairy	Market, wholesaler, agent or trader	28% (16/57)
	Processor or cooperative	79% (45/57)
	Supermarket (direct or aligned contract)	23% (13/57)
	Direct straight to customers	14% (8/57)
	Other	2% (1/57)
Marketing channels: beef	Market, wholesaler, agent or trader	72% (115/160)
	Processor or cooperative	20% (32/160)
	Supermarket (direct or aligned contract)	9% (14/160)
	Direct straight to customers	19% (30/160)
	Other	9% (14/160)
Marketing channels: sheep	Market, wholesaler, agent or trader	83% (123/148)
	Processor or cooperative	11% (17/148)
	Supermarket (direct or aligned contract)	5% (7/148)
	Direct straight to customers	22% (32/148)
	Other	9% (13/148)

Table A10.3. Summary of survey responses on labour
Data source: survey dataset

Survey question or derived variable	Response	Average or percentage (number) of responses
How many people worked on the farm in the past 12 months[a]	/	Average: 4.6 (n=215)
Estimated FTE per farm in the past 12 months[b]	/	Average: 3.4 (n=214)
Estimated FTE per 100ha[b]	/	Average: 3.4 (n=210)
Have you used agricultural contractors in the past 12 months?	Yes	88% (197/224)
	No	12% (27/224)
Components of workforce	Farm holders or business owners	100% (230/230)
	Family members	66% (148/225)
	Non-family workers and staff	44% (98/225)
	Employed farm manager	9% (21/225)
	Students and volunteers	15% (33/225)
Have you experienced difficulties recruiting staff or contractors in the past 2-3 years?	Yes	24% (53/221)
	No	76% (168/221)
Have you used informal help from other farmers in the past 2-3 years?	Yes	33% (73/223)
	No	67% (150/223)

[a] Compiled from numbers of: farm holders or business owners; other family members; employed farm managers; non-family workers and staff; and students and volunteers. Excludes two outliers with horticulture enterprises.
[b] Calculated using coefficients explained in Section 2.3.2. Excludes two outliers with horticulture enterprises.

Table A10.4. Survey responses on external schemes and effect on workload
Data source: survey dataset

Survey question	Response	Average or percentage (number) of responses
Participation in external farm assurance and certification schemes	Red Tractor or FAWL	83% (190/230)
	UK organic (OF&G, Soil Association, other)	16% (37/230)
	Pasture For Life	4% (9/230)
	LEAF	2% (4/230)
	RSPCA Assured	1% (2/230)
	United States National Organic Program	1% (2/230)
	Other	2% (4/230)
	None or no answer	13% (33/230)
Participation in processor's or supermarket's scheme	Yes	15% (34/230)
	No	85% (196/230)
Participation in government stewardship scheme	Environmental Stewardship	32% (73/230)
	Countryside Stewardship	18% (42/230)
	Both CS and ES	3% (8/230)
	Glastir	2% (4/230)
	None or no answer	45% (103/230)
How has the amount of paperwork on the farm changed over the past 2–3 years	Increased	60% (134/223)
	Decreased	1% (2/223)
	About the same	39% (87/223)
How would you describe the current level of paperwork	Manageable	63% (141/223)
	Excessive	36% (80/223)
	Don't know	1% (2/223)
Number of inspections received in the past 12 months[a]	/	Average: 1.5 (*n*=219)
Top three sources of paperwork	Tax and accounts	79% (179/226)
	Farm assurance and certification	69% (155/226)

	Livestock sales and breeding	51% (116/226)
	Basic Payment Scheme	34% (77/226)
	Veterinary jobs	23% (52/226)
	Countryside Stewardship	27% (38/226)
	Marketing and customer management	8% (18/226)
	Diversification business	7% (16/226)
	Land matters, tenancies and planning	4% (8/226)
	Something else	6% (14/226)
	Don't know	1% (3/226)

[a] Respondents may have been inconsistent as to whether they included TB tests in this.

Table A10.5. Survey responses on allocating labour and coping with workloads
Data source: survey dataset

Survey question	Response	Average or percentage (number) of responses
How has the amount of paperwork on the farm changed over the past 2–3 years?	Increased	60% (134/223)
	Decreased	1% (2/223)
	About the same	39% (87/223)
Have you made any significant changes to your farming system or marketing in the past 2–3 years which have increased your workload or your need for workers or contractors?	Yes	22% (48/221)
	No	78% (173/221)
Have you made any significant changes to your farming system or marketing in the past 2–3 years which have decreased your workload or your need for workers or contractors?	Yes	21% (47/222)
	No	79% (175/222)

Appendix 11. Correlations between internal workforce and characteristics of surveyed farms

Table A11.1. Correlations between size of internal workforce and aspects of the farm production and marketing system

Data source: survey dataset

	Number of people who worked on farm			FTE per farm			FTE per 100ha		
	Average	PCC	*p*	Average	PCC	*p*	Average	PCC	*p*
Area farmed (ha)	/	0.297**	0.000	/	0.356**	0.000	/	-0.187**	0.007
Dairy farm	7.3	0.354**	0.000	5.9	0.427**	0.000	3.1	-0.038	0.582
Dairy eco-extensive	10.6	0.321**	0.000	8.0	0.320**	0.000	3.5	0.006	0.927
Dairy non-eco-extensive	6.4	0.202**	0.003	5.3	0.282**	0.000	2.9	-0.045	0.513
LFA grazing livestock farm	3.2	-0.143*	0.037	2.4	-0.130	0.057	2.9	-0.041	0.550
LFA eco-extensive	2.5	-0.064	0.350	2.1	-0.050	0.470	2.1	-0.036	0.608
LFA non-eco-extensive	3.3	-0.125	0.067	2.4	-0.118	0.085	3.0	-0.030	0.667
Lowland grazing livestock farm	2.9	-0.200**	0.003	2.0	-0.202**	0.003	3.5	0.016	0.816
Lowland eco-extensive	4.1	-0.021	0.761	3.3	-0.003	0.962	2.5	-0.034	0.620
Lowland non-eco-extensive	2.7	-0.207**	0.002	3.9	-0.218**	0.001	3.7	0.029	0.672
Mixed farm	4.8	0.022	0.743	3.1	-0.053	0.436	1.9	-0.202**	0.003
Mixed eco-extensive	5.4	0.048	0.483	3.5	0.007	0.919	1.8	-0.084	0.226
Mixed non-eco-extensive	4.6	-0.003	0.960	3.9	-0.062	0.370	1.9	-0.170*	0.014
Smallholding	1.6	-0.141*	0.039	1	-0.145*	0.034	17.4	0.594**	0.000
Dairy only	7.6	-0.216**	0.001	5.8	0.227**	0.001	3.2	-0.012	0.867
Beef and/or sheep only	2.9	-0.318**	0.000	2.1	-0.311*	0.000	4.1	0.125	0.071
Dairy and beef and/or sheep	5.8	0.065	0.341	4.4	0.074	0.283	3.4	0.001	0.988
Beef and/or sheeo with mixed enterprise(s)	4.6	0.003	0.967	3.0	-0.074	0.281	2.7	-0.096	0.164
Dairy, mixed enterprise(s) and maybe also beef and/or sheep	8.0	0.250**	0.000	6.9	0.337**	0.000	3.2	-0.045	0.516
Number of farming enterprises	/	0.124	0.069	/	0.071	0.303	/	-0.208**	0.002
Single farming enterprise	4.5	-0.013	0.853	3.4	0.008	0.904	5.1	0.219**	0.002
Multiple farming enterprise	4.6	0.013	0.853	3.4	-0.008	0.904	2.8	-0.210**	0.002
Eco-extensive	/	0.191**	0.005	/	0.178**	0.000	/	-0.080	0.247
Cattle but no sheep	5.6	0.159*	0.020	4.5	0.224**	0.001		-0.033	0.633
Sheep but no cattle	3.0	-0.148*	0.030	2.2	0.144*	0.036		0.284**	0.000
Both cattle and sheep	4.4	-0.045	0.515	3.0	-0.110	0.109		-0.175*	0.011
Production system grouping 1	4.9	0.010	0.882	1.8	0.051	0.464	9.4	0.240**	0.001
Production system grouping 2	4.6	-0.003	0.968	2.3	-0.006	0.934	3.9	0.018	0.795
Production system grouping 3	3.6	-0.058	0.405	2.8	-0.046	0.511	1.8	-0.085	0.224
Production system grouping 4	5.0	-0.046	0.509	3.1	-0.016	0.815	2.6	-0.083	0.237
Production system grouping 5	5.1	-0.042	0.540	3.6	0.020	0.773	2.8	-0.059	0.402
Production system grouping 6	4.2	-0.084	0.227	2.5	-0.052	0.453	3.9	0.086	0.220
Production system grouping 7	5.8	0.070	0.313	3.8	0.101	0.146	2.4	-0.056	0.420
Block calving once a year	5.6	0.114	0.099	3.3	0.054	0.437	2.4	-0.103	0.140
Block calving twice a year	4.2	-0.043	0.535	2.9	-0.070	0.314	1.9	-0.137*	0.048
Year-round calving	5.3	0.103	0.137	3.2	0.188**	0.006	3.1	-0.040	0.563
Has cattle but does no calving	3.5	-0.081	0.241	2.3	-0.103	0.136	3.9	0.033	0.641
Some or all indoor lambing	4.2	-0.092	0.177	2.8	-0.167*	0.014	3.5	0.023	0.738
Outdoor lambing	3.7	-0.073	0.283	2.4	-0.062	0.369	3.9	0.035	0.613
Has sheep but does no lambing	3.8	-0.036	0.599	3.2	-0.021	0.761	2.5	-0.039	0.573
Set stocking	3.1	-0.139*	0.047	2.3	-0.128	0.068	4.2	0.062	0.380

	Number of people who worked on farm			FTE per farm			FTE per 100ha		
	Average	PCC	*p*	Average	PCC	*p*	Average	PCC	*p*
Rotational grazing	3.9	-0.186*	0.007	2.7	-0.217**	0.000	3.6	0.032	0.650
Set stocking and rotational grazing	4.6	0.004	0.951	3.0	-0.018	0.800	1.8	-0.101	0.150
Some or all intensive rotational grazing	7.5	0.315**	0.000	4.0	0.344**	0.000	3.2	-0.017	0.805
Some or all zero grazing	8.0	0.102	0.145	3.3	0.129	0.065	3.0	-0.013	0.859
Diversification business	6.4	0.272**	0.000	3.4	0.207**	0.002	3.0	-0.060	0.390
Contracting business	5.0	0.048	0.482	3.3	0.044	0.519	2.9	-0.053	0.446
Direct sales (any produce)	5.6	0.138*	0.043	3.2	0.081	0.237	5.4	0.251**	0.000
Number of farm business elements	/	0.235**	0.001	/	0.157*	0.023	/	-0.099	0.157

PCC = Pearson Correlation Coefficient. *p* is 2-tailed significance at 0.01 (**) or 0.05 (*) level. Such values are highlighted (positive correlations in green, negative correlations in yellow).

Appendix 12. Flexible labour and peaky farming practices

This appendix presents results of analysis to identify any associations in the questionnaire survey data between the use of flexible labour in the internal workforce (i.e. part-time, seasonal and casual labour) and farming practices and enterprises which were identified in Chapter 7.2 as being particularly time-consuming or whose labour demand fluctuates during the farming year. No statistical tests were performed for this analysis, so the statistical significance of any observed correlations cannot be estimated.

A12.1. Block calving

One of the factors that probably contributes to the relatively low amount of flexible labour used on dairy farms is their predominant practice of calving year-round as opposed to in a block in spring or autumn. Seventy-five per cent of the dairy farms in the survey (*n*=43) did all-year-round calving, versus only 16% (*n*=9) that did their calving in a single block. This is likely to smooth out the labour demand across the farming year, on farms that already have quite high levels of routine work because of their requirement for daily milking.

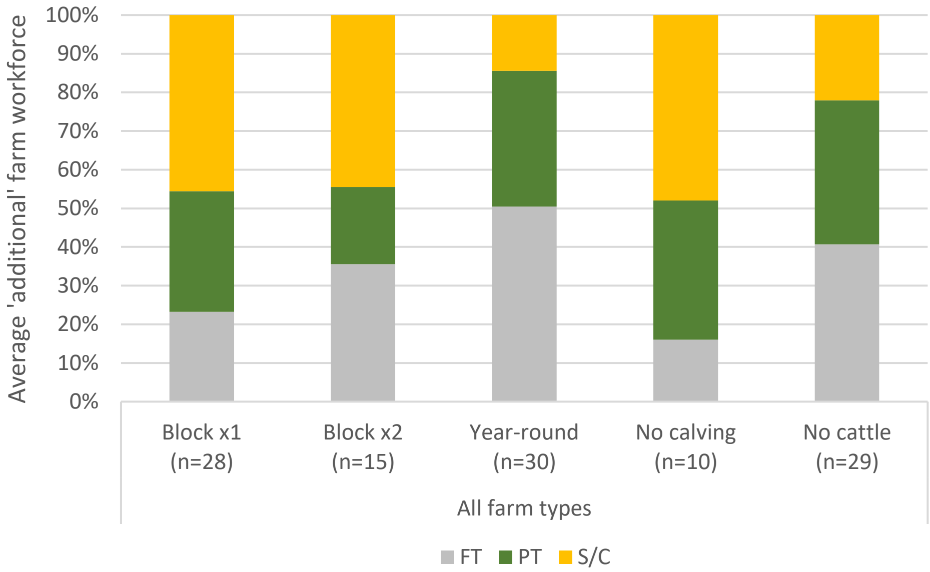
Year-round calving for beef cattle was also practised by 33% of the LFA, 25% of the lowland and 9% of the mixed farms in the survey. It appears that these farms, too, use proportionately and quantitatively less flexible labour than others. According to the survey, farms of all types that did year-round calving had a higher average number of full-time workers in addition to the principal owner (2.8 people/farm) than farms that did block calving once or twice a year (1.8 and 1.3 people/farm, respectively) or farms that have cattle but do not do calving (0.7 people/farm). By number of people, workforces on year-round calving farms are made up of proportionally more full-time workers (52%) and proportionally fewer part-time (19%) or seasonal and casual (10%) workers.

In contrast, the farms that did block calving once a year used more flexible labour on average, or were more likely to use flexible labour, than farms that did year-round calving or did not do calving at all. The average workforce of a farm that block calved once a year included a higher average number of non-family seasonal or casual workers (1.4 people/farm) and part-time workers (1.4 people/farm), which translates into those worker types accounting for a larger percentage of the workforce by number of people (25% and 25%, both) and a smaller percentage from full-time workers (33%). LFA and lowland farms tended to draw their flexible labour mainly from part-time family members; on mixed farms it was more from non-family seasonal or casual workers. In the dairy sector, the farms that did block calving once a year (*n*=9) were more likely to use non-family part-time labour (78% likelihood) and non-family seasonal or casual labour (33% likelihood) than dairy farms that did year-round calving (*n*=42) (31% and 21%, respectively).

Indeed, farms of all types that did block calving once a year were more likely (71% likelihood) than the average farm in the survey (59% likelihood) to use part-time labour; and also more likely (41%) than average (19%) to use seasonal or casual labour. They were more likely to use flexible labour than either farms that did year-round calving or, surprisingly, farms that did block calving twice a year. This might indicate that block calving twice a year is much less peaky and is closer to year-round calving in its labour demands.

Controlling for lambing regime

These findings were not analysed statistically and without controlling for other variables, it is difficult to disentangle the flexible labour patterns of calving from the labour patterns of other aspects of the farm business, particularly whether the farm does lambing. One way in which we can attempt this is to control for the effect of lambing by comparing the workforces of farms that all followed the same lambing regime but varied in their calving regime. We selected only the farms in the survey that did indoor lambing, the most common situation for farms with sheep.



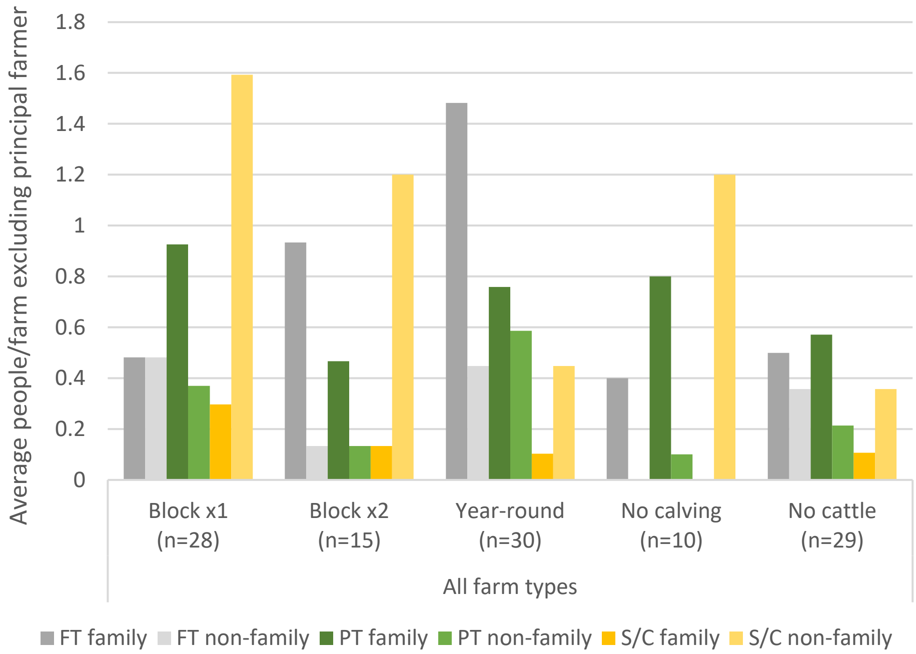


Figure A12.1. Comparison of the average 'additional' internal workforce of farms that did indoor lambing but varied in their calving, by type of worker
Data source: survey dataset

Block x1 = block calving once a year, Block x2 = block calving twice a year, FT = full time, PT = part time, S/C = seasonal or casual
Workforce is 'additional' because it is additional to the labour provided by the principal farmer, which is usually full time

Figure A12.1 shows that compared with the indoor-lambing farms that did year-round calving, the indoor-lambing farms that did block calving once a year had proportionally fewer additional full-time workers in the workforce (the grey parts of the chart) and proportionally more flexible workers in the workforce (the green and yellow parts of the chart). They used relatively large amounts of part-time family labour and non -family seasonal or casual labour. Non-family seasonal or casual labour was also high among the farms that did twice-a-year block calving and the farms that did no calving at all – because they purchased and finished store cattle, for example.

Figure A12.2 shows the results just for groups of LFA, lowland and mixed farms that did indoor lambing. On lowland farms, most of the additional flexible labour came from **part-time family members**, whereas the mixed farms derived more of the additional labour from **non-family seasonal or casual workers**. Since block calving either once or twice a year was particularly common on mixed farms in the survey, being reported by 59% of the mixed-farm respondents, this could help to explain why the 56 mixed farms with cattle were most likely of all 189 farms in the survey with cattle to report using seasonal or casual labour (43% likelihood). On both mixed and lowland farms that did indoor-lambing, block calving once a year was associated with a larger workforce than year-round calving. These findings might suggest that block calving requires more labour-input overall than year-round calving.

The pattern is not so clear on LFA farms. Here, the size of the average additional workforce of the indoor-lambing farms that did once-a-year block calving was no larger than the average additional workforce for year-round calving, and year-round calving was associated with a greater proportion of seasonal or casual labour than block calving was, although the farms doing block calving did derive more labour from part-time rather than full-time family members. Could it be that on LFA farms, the workforce for block calving is about the same, even though it apparently requires more seasonal labour than year-round calving, because at those peak calving periods, the full-time and part-time family members of the workforce absorb the additional hours? We return to this possibility in the discussion about lambing, below.

Overall, although the sample is small and we have not used statistical techniques to control for confounding variables, the data do indicate that **block calving, with its peaky labour profile, may be associated with a greater use of flexible labour (typically part-time family members or non-family seasonal or casual workers) than year-round calving**. One reservation is that given block calving is a seasonal activity, we might have expected to see greater use of seasonal and casual labour rather than part-time labour, especially on LFA and lowland farms, but as argued Chapter 9.2.1.2, this might be partly due to survey respondents reporting temporary family members as ‘part time’ (even though question 22 of the questionnaire specified that part-time meant year-round).

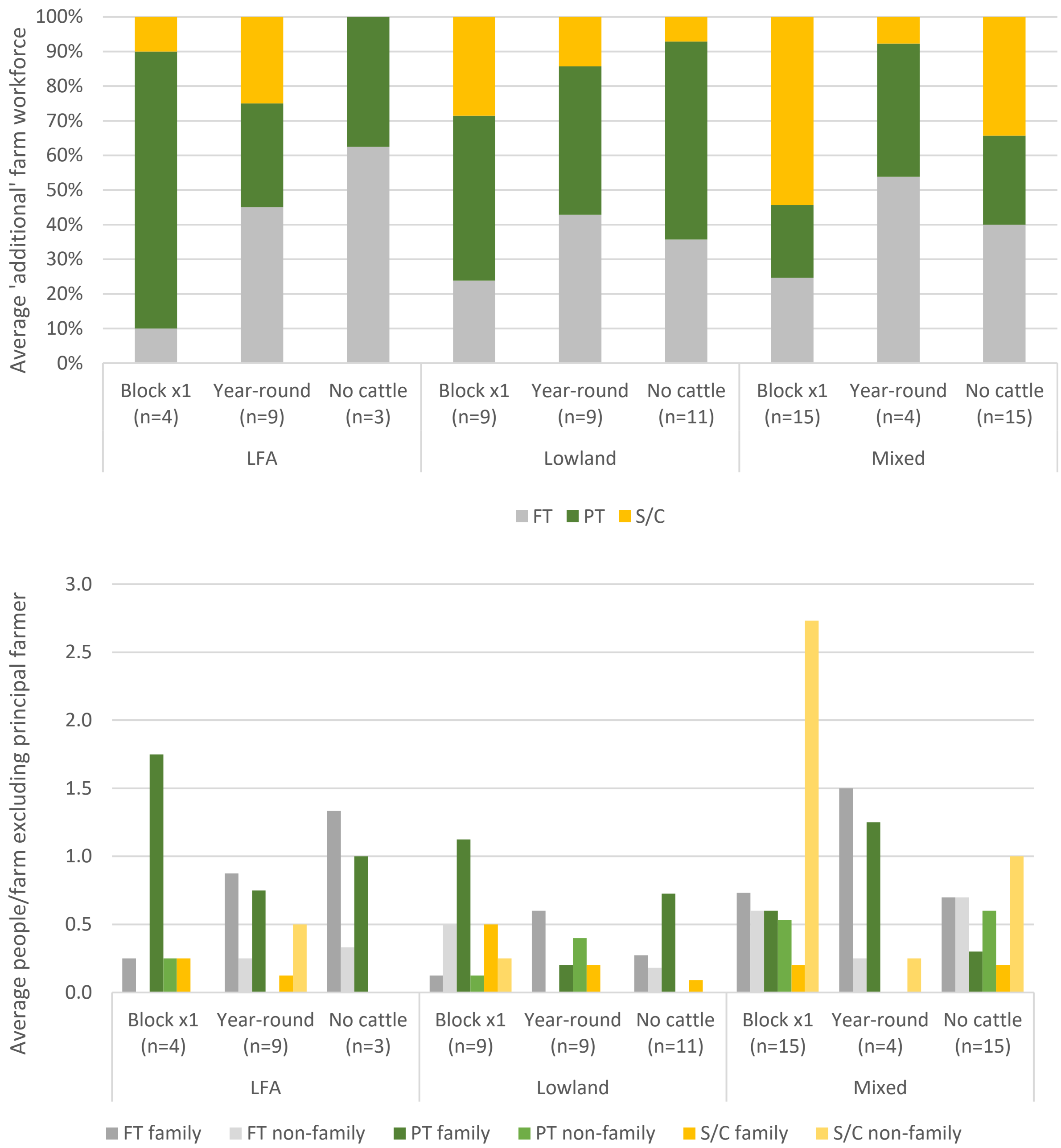


Figure A12.2. Comparison of the average 'additional' internal workforce of LFA, lowland and mixed farms that did indoor lambing but varied in their calving, by type of worker
Data source: survey dataset

Block x1 = block calving once a year, FT = full time, PT = part time, S/C = seasonal or casual
Workforce is 'additional' because it is additional to the labour provided by the principal farmer, which is usually full time

A12.2. Lambing

It also appears that indoor lambing is associated with flexible labour. Farms that did indoor lambing averaged the largest workforce overall of all farms with sheep in the survey (4.2 people/farm), and 71% of them used **part-time labour**, which is higher than the 59% of all farms in the survey.

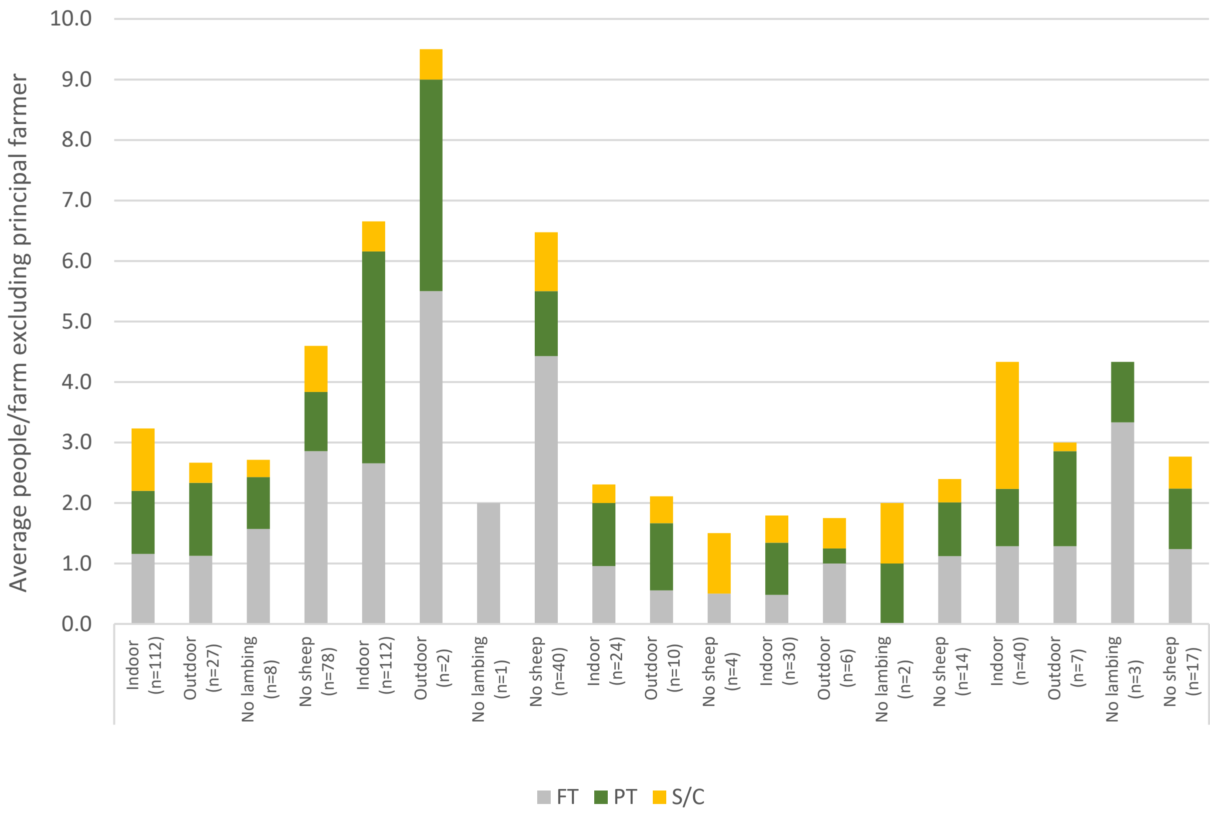


Figure A12.3. Comparison of the average 'additional' internal workforce of surveyed farms based on their lambing regime, by type of worker
Data source: survey dataset
Indoor = indoor lambing, Outdoor =outdoor lambing, FT = full time, PT = part time, S/C = seasonal or casual
Note: There were no LFA farms that had sheep but did not do lambing.

Farms of all types that did indoor lambing were also more likely to use seasonal or casual labour, both family (11% likelihood) and non-family (24%), than farms that did outdoor lambing (7% and 15%, respectively). This varies by type, however. On LFA and lowland farms, the numbers are very small, but the higher likelihood of seasonal or casual labour being used on indoor lambing operations is linked to family members, whereas farms with outdoor lambing were more likely to use non-family seasonal or casual labour workers.

Consequently, the farms of all types that did indoor lambing (*n*=112) have a higher average number of **non-family seasonal or casual workers** (0.9 people/farm) in their additional workforce than farms with sheep enterprises that did outdoor lambing (*n*=27) (0.3) or did not lamb at all (*n*=8) (0.1). The numbers are not large but they mean that non-family seasonal or casual workers represent a higher percentage of all people in the workforce when the farm does indoor lambing. The questionnaires and interviews highlighted veterinary students as one such source of temporary flexible labour. The numbers are small, but they do suggest that respondents' farms were more likely to have used students or volunteers if they did indoor lambing (or block calving once a year) – see Table A12.1.

Table A12.1. Percentage of surveyed farms that used students or volunteers, by farm type and selected lambing and calving regime (*n*=217)

	All farms		Percentage of all farms that follow this regime						
Used students or volunteers	**Number**	**Percentage**	**Block calving once a year**	**Year-round calving**	**Indoor lambing**	**Outdoor lambing**	**Has sheep but no lambing**	**Indoor lambing and block calving once a year**	**Indoor lambing and year-round calving**
All farms									
Full time	6	3%	4%	4%	3%	0%	0%	0%	7%
Part time	12	5%	12%	5%	4%	4%	25%	11%	0%
Seasonal or casual	16	7%	16%	5%	9%	0%	0%	18%	7%
Any	**33**	**15%**	**29%**	**15%**	**15%**	**4%**	**25%**	**29%**	**13%**
Dairy									
Full time	5	9%	22%	7%	15%	0%	0%	0%	17%
Part time	6	11%	33%	7%	0%	50%	0%	0%	0%
Seasonal or casual	4	7%	0%	7%	8%	0%	0%	0%	8%
Any	**14**	**25%**	**44%**	**21%**	**23%**	**50%**	**0%**	**0%**	**25%**
LFA									
Full time	0	0%	0%	0%	0%	0%	0%	0%	0%
Part time	1	3%	14%	0%	4%	0%	0%	25%	0%
Seasonal or casual	2	5%	14%	8%	4%	0%	0%	0%	11%
Any	**3**	**8%**	**29%**	**8%**	**8%**	**0%**	**0%**	**25%**	**11%**
Lowland									
Full time	0	0%	0%	0%	0%	0%	0%	0%	0%
Part time	1	2%	0%	8%	0%	0%	50%	0%	0%
Seasonal or casual	3	6%	13%	0%	10%	0%	0%	22%	0%
Any	**4**	**8%**	**13%**	**8%**	**10%**	**0%**	**50%**	**22%**	**0%**
Mixed									
Full time	1	1%	0%	0%	3%	0%	0%	0%	0%
Part time	3	4%	10%	0%	8%	0%	0%	13%	0%
Seasonal or casual	7	10%	25%	0%	13%	0%	0%	20%	0%
Any	**11**	**16%**	**35%**	**0%**	**23%**	**0%**	**0%**	**33%**	**0%**

In three sectors – dairy, lowland and mixed farming – the farms that did indoor lambing had a higher proportion of flexible workers in their workforce than the average farm in their sector. This is shown by the green and yellow parts of Figure A12.3. However, this is only when part-time and seasonal or casual labour are taken together; on dairy and lowland farms, the average number of seasonal or casual workers was higher on farms that either had no sheep or did no lambing at all.

On dairy farms that did indoor lambing, flexible workers made up 59% of the average additional workforce (52% part time and 7% seasonal or casual), compared with 31% (19% PT and 12% S/C) for the dairy sector as a whole; on lowland farms the figure is 48% (32% PT and 16% S/C), compared with 45% (29% PT and 16% S/C) for the sector; and in mixed farming the figure is 58% (18% PT and 40% S/C), compared with 51% (22% PT and 29% S/C) for the sector.

While we cannot directly link this to the practice of indoor lambing, and no statistical analysis was done to assess if the differences are statistically significant, **the data indicate a pattern of comparatively high use of flexible labour on farms where indoor lambing takes place**. The dairy farms with indoor lambing were more likely to use family and non-family part-time labour; the lowland farms were also more likely to use part-time family labour; and mixed farms were more likely to use non-family seasonal or casual labour.

The LFA findings

In LFA farming, however, the farms that did indoor lambing had a lower percentage of flexible workers (41%) in their workforces than the other LFA farms that did outdoor lambing (50%). If we compare how many farms reported using part-time and seasonal or casual workers, we find that of the LFA farms that did indoor lambing, 25% used seasonal or casual labour, 58% used part-time labour and 54% used additional full-time labour; versus 20% seasonal or casual, 70% part-time and 64% full-time among the LFA farms with outdoor lambing operations. On average, the LFA farms with indoor lambing also used less seasonal or casual labour than the four LFA farms that just had beef cattle, although they used more part-time workers. Only three LFA farms used students or volunteers at all.

These figures are slightly surprising because they go against the pattern observed in the other sectors. Why should LFA indoor lambing systems use less part-time labour than outdoor lambing systems, which are supposed to be less labour-demanding, and less seasonal labour than the farms that did no lambing at all?

More broadly, the use of flexible labour in the LFA sector as a whole is also surprisingly low given its lambing and calving patterns. Indoor lambing was very common among the LFA farms in the survey, being reported by 62% of them (compared with 58% of the lowland farms, 57% of the mixed farms and 23% of the dairy farms). A further 26% LFA farms practised outdoor lambing, another peaky practice, which was more than any other sector. Therefore, if we assume that lambing is associated with temporary flexible labour, we might expect to see high and consistent levels of flexible labour throughout the LFA part of the sample. (Furthermore, 46% of the LFA farms did block calving once or twice a year, second only to mixed farms, which might also be expected to boost their use of flexible labour.) However, this is not really what we find: only 56% of all LFA farms used part-time labour in addition to the principal farmer and 26% used additional seasonal or casual labour: the lowest percentages of all farm types in the survey except smallholdings. Part-time labour makes up a large proportion of the average LFA workforce, but that is only because LFA farms reported such low usage of full-time and non-family workers.

The sample is small and the differences between the farms are probably too slight to be meaningful, but they are surprising and we might forward some speculative explanations for what is observed.

Firstly, some possibilities to explain the low use of flexible labour relative to other farms lambing indoors:

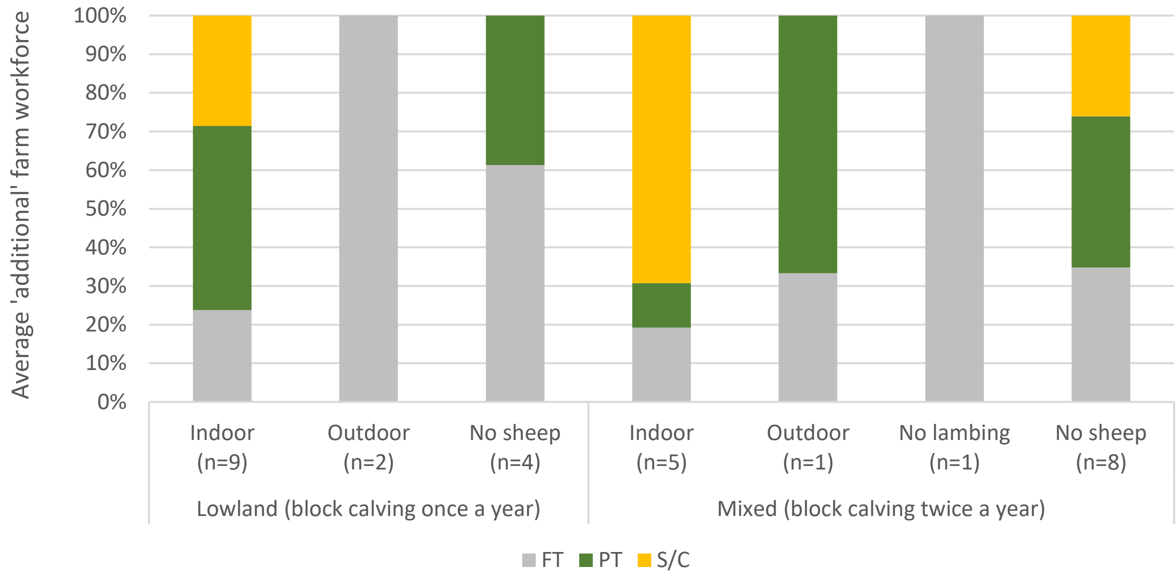
1. Indoor lambing as practised in upland sheep farms is not so 'peaky' as it is on other farms, and so it is not associated with as much flexible labour;
2. Outdoor lambing is more labour-demanding in upland areas than elsewhere, perhaps because of tougher weather and terrain, and so it is associated with higher percentages of flexible labour than indoor lambing;
3. Lambing (and block calving) creates less demand or use for flexible labour than other aspects of farming such as horticulture or diversification (discussed below), and those aspects are less common on LFA farms than other types of farm;
4. LFA farms do not respond to the peaky labour demands of lambing in the same way as other farms, because:
    a. There is under-employment or surplus labour in the average LFA farm workforce, so the principal farmer and other permanent members can increase their own working hours at peak lambing times with less need to mobilise additional labour;
    or
    b. They have less access to, or ability to pay for, additional family and non-family labour than other farms, and so at peak lambing times the LFA farmers must meet much of the additional labour demand by working longer hours themselves, and thus either move from under-employment to full employment or from full employment to over-employment at those peak times.

Possibilities 2 and 4 can be induced from other findings in this study. For example, Respondent 243 from Shropshire described during their interview the physical challenges of outdoor work on an upland sheep farm in cold weather. On LFA farms, the average workforce when the farm did outdoor lambing (3.1 people/farm) is only slightly smaller than when the farm did indoor lambing (3.3 people/farm) and they reported a similar number of part-time workers, whereas on lowland farms the average workforce for outdoor lambing is smaller still (2.3 people/farm outdoor versus 2.7 people/farm indoor) and the average number of part-time workers is lower. As for possibility 4, plenty of LFA farmers were among the interviewees who reported working exceptionally long hours during indoor lambing (e.g. Respondent 95, 109, 124); and the FBS data review identified under-employment among older principal farmers on English LFA farms. However, a larger sample and data on hours worked would be needed to test these possibilities.

Secondly, concerning the lower than expected use of flexible labour overall. Perhaps the 39 LFA farms in the survey used less flexible labour than expected, given how many of them did indoor or outdoor lambing, because compared with other farms, fewer of them also did block calving. Possibly, there is a compound effect, where doing lambing in combination with calving, especially both in spring, creates especially high demand for temporary additional labour. This was explained during an interview by Respondent 297, when she said how important it was to schedule spring calving to come after lambing had finished, otherwise they would not have the manpower to cope if things went wrong. Only four (10%) of the LFA farms did indoor lambing and once-a-year block calving, rising to 10 (25%) if we include block calving twice a year. These percentages are lower than for lowland farms (17% and 23%) and for mixed farms (21% and 28%). As shown in Figure A12.3 above, **all farms that did indoor lambing plus block calving once a year recorded**

the highest average contribution of flexible labour to the workforce of all possible combinations with indoor lambing; they were also the most likely to use part-time (71% of all such farms) and seasonal or casual labour (46%). This includes the four LFA farms. Perhaps the LFA sector as a whole would have recorded greater use of flexible labour if more of them did block rather than year-round calving. While year-round calving may be associated with the suckler herds that predominate in upland cattle systems, it might also be a strategic adaptation by LFA farmers to limit the peakiness of their workloads.

Controlling for calving regime



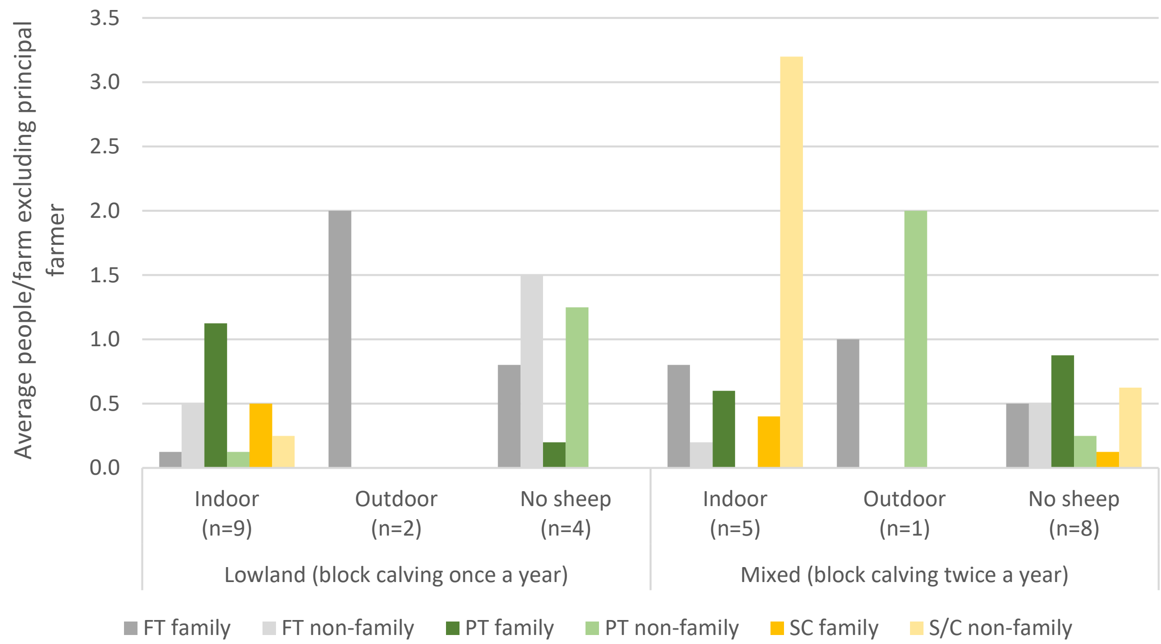


Figure A12.4. Comparison of the average 'additional' internal workforce of lowland and mixed farms that did block calving but varied in their lambing, by type of worker
Data source: survey dataset

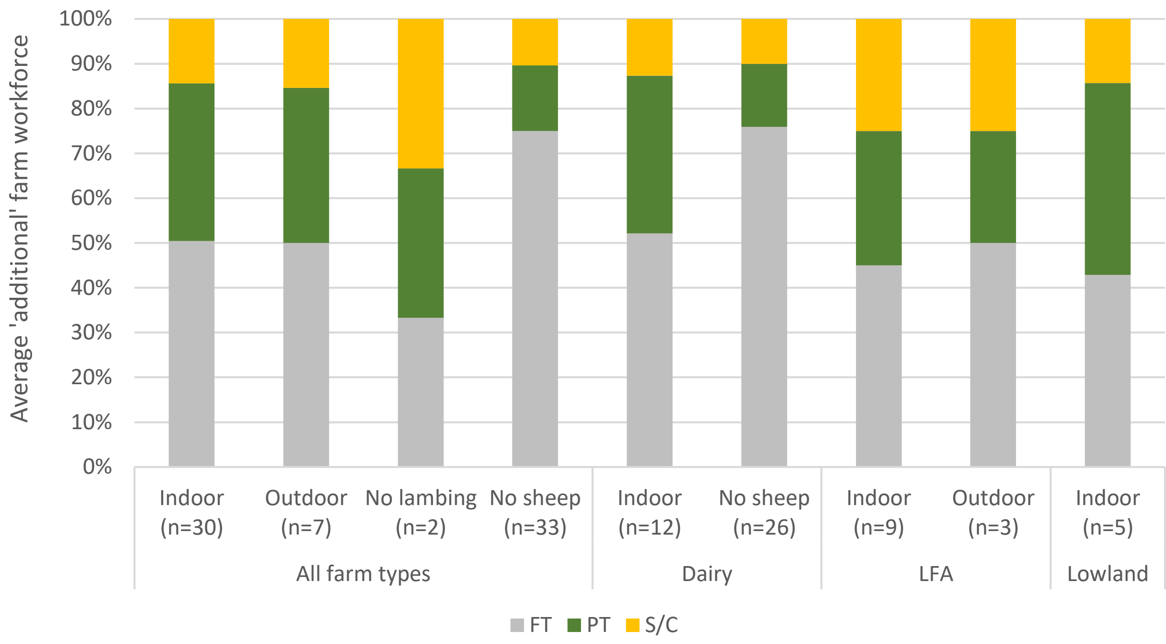
Indoor = indoor lambing, Outdoor = outdoor lambing, FT = full time, PT = part time, S/C = seasonal or casual
Workforce is 'additional' because it is additional to the labour provided by the principal farmer, which is usually full time

Similar to what we did earlier, we can try to control for the compounding effect of labour-demanding calving practices by comparing the workforces of farms that all followed a similar calving regime but differed in how, if at all, they approached lambing. Since indoor lambing is the most common situation among farms with sheep, it is difficult to find large enough groups of alternative lambing strategies for comparison, so this exercise is limited by very small sub-samples.

On the left side of the charts, Figure A12.4 shows groups of lowland farms which all did block calving once a year. The figure indicates that the nine farms that did indoor lambing used a larger proportion of flexible labour (green and yellow in the figure) than the six farms that did outdoor lambing or had no sheep. A similar finding is reached when we compare groups of mixed farms which all did block calving twice a year, on the right side of the charts.

We can also compare farms that all did year-round calving, to see how their workforces varied with their lambing approach. As already noted, these year-round-calving farms are likely to have a fairly high percentage of additional full-time labour. Even so Figure A12.5 shows that among the small groups of dairy, LFA and lowland farms that can be compared, the percentage of the average workforce that is represented by flexible workers is usually – but not always – highest in the groups that did indoor lambing.

In summary, **there is a general tendency for the farms in the survey that did indoor lambing to have been more likely to use flexible labour, and to have used proportionately more flexible labour, than other farms** that did outdoor lambing or did no lambing at all. This is particularly evident among dairy farms, which made heavy use of additional part-time labour; and mixed farms, which displayed an increased use of seasonal or casual labour. However, the data are rather variable and the differences between groups are often very small (not helped by the small sample sizes). Statistical significance was not estimated, but a tentative conclusion is that **although indoor lambing clearly requires a lot of labour in a short period, it does not always lead to markedly greater usage of temporary family or non-family workers.** Perhaps this is because much of the extra work of indoor lambing is absorbed by full-time or part-time members of the workforce, a scenario that seems especially likely on the LFA farms in the sample, and perhaps there are other aspects of livestock farm businesses that more strongly drive the mobilisation of additional temporary labour.



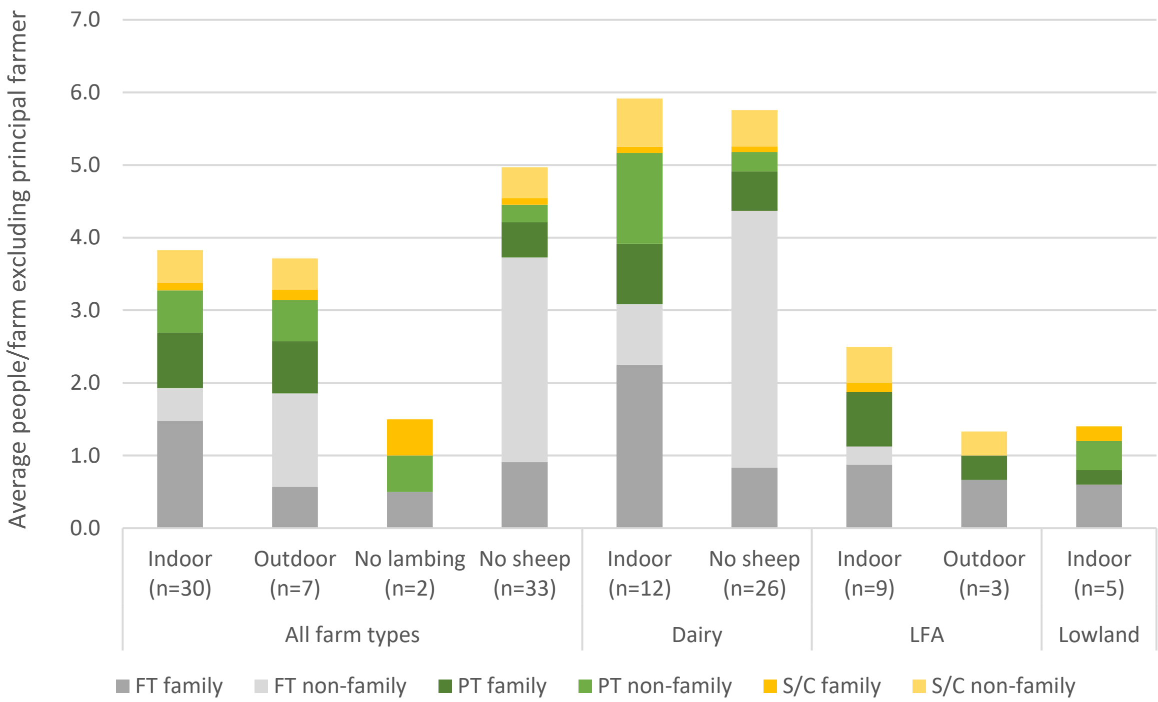


Figure A12.5. Comparison of the average 'additional' internal workforce of surveyed farms that did year-round calving but varied in their lambing, by type of worker

Data source: survey dataset

Indoor = indoor lambing, Outdoor = outdoor lambing, FT = full time, PT = part time, S/C = seasonal or casual
Workforce is 'additional' because it is additional to the labour provided by the principal farmer, which is usually full time

A12.3. Cattle and sheep together

It was suggested above that there may be a compound effect where a farm that does both block calving and lambing has a particularly high demand for flexible labour. We can see if there are any patterns more broadly for farms that kept beef cattle and sheep together.

Excluding smallholdings because their workforces were so small and distinctive, there were 92 lowland and LFA farms in the sample that kept sheep and/or beef cattle and had no other farming enterprise except for perhaps cultivating some cereals, brassicas or roots for fodder crops. Most of the LFA farms and around half of the lowland farms had cattle and sheep together (*n*=58); but the others, mostly lowland farms, specialised in keeping only sheep (*n*=16) or only beef cattle (*n*=18).

One of the 92 respondents did not answer question 22 on workforce in the questionnaire, and seven indicated what kind of workers they had but did not give numbers. Two further respondents did not answer question 12 on their calving and/or lambing regimes. This means that only 88 farms could be used to assess the relationship between calving/lambing and types of worker, and only 81 could be used to assess the relationship between calving/lambing and size of workforce. These reduced samples are used for the tables and figures below.

Table A12.2. Profile of LFA and lowland farms in survey (*n*=88).
Excludes four non-responses (total *n*=92)

	Sheep only	Beef cattle only	Sheep and beef cattle
LFA	4	4	31
Lowland	12	12	25
Total	16	16	56
Average farmed area (ha) – LFA	168	96	118
Average farmed area (ha) – lowland [a]	61	339 (57)	229 (101)
Average farmed area (ha) – total	87	278 (67)	168 (111)
Indoor lambing [b]	14 (88%)	/	40 (70%)
Outdoor lambing only	2 (12%)	/	14 (25%)
No lambing	0 (0%)	/	0 (0%)
Block calving once a year	/	5 (31%)	17 (30%)
Block calving twice a year	/	1 (6%)	14 (25%)
Year-round calving	/	5 (31%)	21 (36%)
No calving	/	5 (31%)	6 (9%)
Indoor lambing and block calving once a year	/	/	13 (23%)

[a] Average farmed area includes two outlier lowland farms with exceptionally large farmed areas over 3,000ha. The averages without those two outliers are shown in brackets.
[b] 'Indoor lambing' category includes 11 farms that did some outdoor lambing in addition to indoor lambing; 'Outdoor lambing only' category includes only farms that did outdoor lambing and no indoor lambing.

Table A12.3. Percentages of lowland and LFA farms that used flexible labour, by type of livestock kept (*n*=88). Excludes four non-responses (total *n*=92)
Data source: survey dataset

		All farms in survey	Sheep only	Beef cattle only	Sheep and beef cattle
Full time	Family members and any additional owners	52%	50%	44%	34%
	Non-family members	29%	13%	19%	5%
	From any source	**64%**	**50%**	**50%**	**39%**
Part time (PT)	Family members and any additional owners	46%	63%	38%	50%
	Non-family members	23%	0%	19%	13%
	From any source	**59%**	**63%**	**56%**	**61%**
Seasonal or casual (S/C)	Family members and any additional owners	10%	6%	13%	11%
	Non-family members	23%	0%	19%	21%
	From any source	**31%**	**6%**	**25%**	**32%**
Both PT and S/C	Family members and any additional owners	5%	75%	94%	80%
	Non-family members	5%	0%	0%	4%
	From any source	**19%**	**0%**	**6%**	**23%**
Total responses		225	16	16	56

Table A12.2 shows that the majority of sheep-only farms practised indoor lambing, and so were likely to have experienced a high demand for labour at lambing time. Table A12.3 shows that the farms with only sheep were very unlikely to have used seasonal or casual labour, but more likely than the others to have used part-time family members. Taken together, these findings support the interpretation proposed earlier that when it comes to lambing, it is common for farmers in the survey to turn to part-time family members and/or work longer hours themselves rather than recruit additional seasonal or casual workers; and therefore that **lambing, while labour-demanding, is not a strong driver of non-family seasonal and casual labour in agriculture** (or at least among the surveyed farms). One reservation here is that many of the lowland sheep-only farms were rather small, averaging only 61ha, and perhaps larger operations with presumably more breeding ewes would have been more likely to use additional non-family labour.

The farms with beef cattle were split more evenly between block calving once a year, calving year-round or not calving at all. They were more likely than the sheep-only farms to have used non-family labour, although the rates are still much lower than the rates of non-family labour reported for mixed farms with horticulture, for example (see below). This supports the conclusion that **beef cattle farming is more likely than sheep farming to involve additional non-family flexible labour**, either during calving or perhaps at other times of the year for tasks such as gathering cattle for TB testing, moving cattle to new pasture or raising youngstock (recalling Respondent 243 who said it takes three people to move cattle and Respondent 376 who described needing two people to work the cattle crush for TB tests, for example). That cattle are larger and more dangerous animals to work with than sheep must be a factor here

The farms that had both cattle and sheep had a smaller average farmed area than the specialist beef farms. This might help to explain why they also had a smaller average workforce by number of people, including fewer full-time workers in addition to the principal owner. Proportionally, however, the farms with cattle and sheep recorded a greater use of non-family flexible labour than the specialist beef farms, especially part-time family members. Perhaps they had peakier workloads, in some cases doing indoor lambing as well as block calving and as we have seen, lambing appears to have a strong association with part-time family labour.

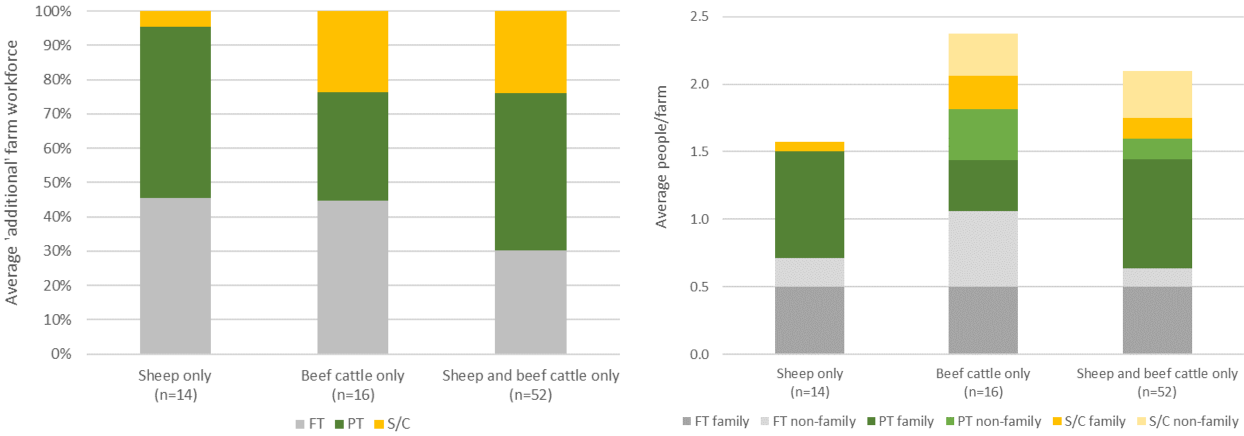


Figure A12.6. Comparison of the average 'additional' internal workforce of LFA and lowland farms (*n*=82), by type of livestock
Data source: survey dataset

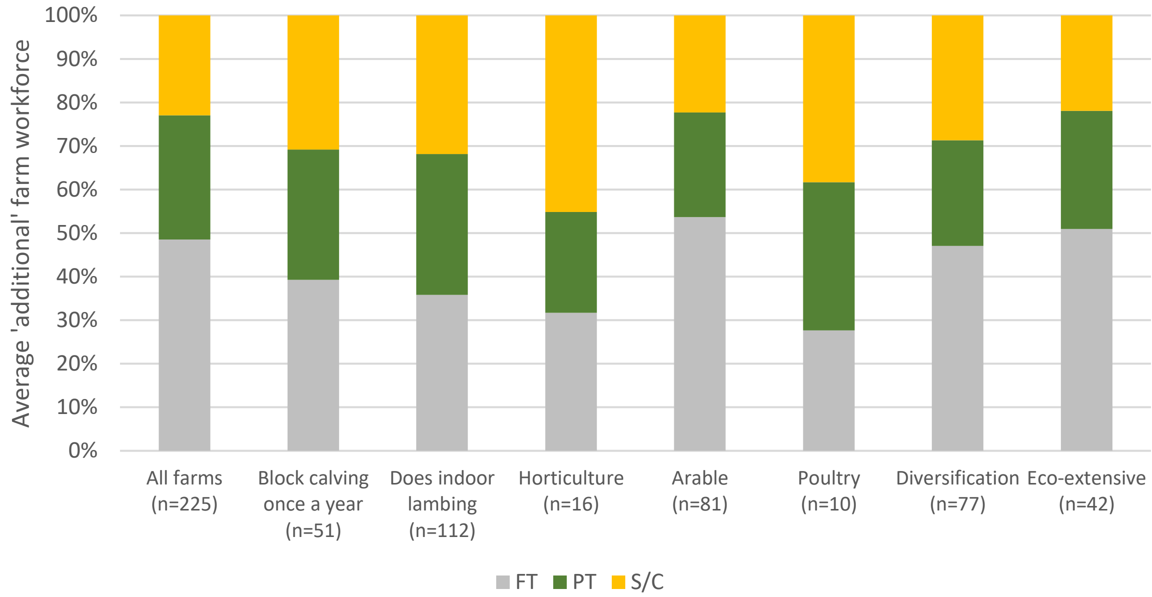
Excludes 10 farms where data are missing from respondents' answers.
FT = full time, PT = part time, S/C = seasonal or casual
Workforce is 'additional' because it is additional to the labour provided by the principal farmer, which is usually full time

A12.4. Other aspects

Having a **horticulture or orchard enterprise** is associated with a higher than average usage of flexible labour, especially temporary paid labour. This is as expected, given the high seasonality and labour intensity of fruit and vegetable production. Seventeen farms in the survey had such an enterprise, of which 14 were mixed farms, two were dairy and one a smallholding. Half of them (50%) used seasonal or casual labour, which is much higher than the 19% of all farms in the survey. A larger percentage of them (75%) also used part-time labour, both family and non-family, than the percentage of all farms (59%). Even discounting two outlier respondents with horticulture because their workforces were so large, farms with horticulture or orchards tended to have substantial non-family seasonal or casual workers in the workforce (average 2.4 per farm), representing a very high 35% of total workforce by number of people and contributing to an exceptionally large average workforce (6.8 people per farm).

A smaller number (*n*=10) of surveyed farms had a **poultry enterprise** (of which eight were mixed farms, one a dairy farm and one a smallholding). Two of the interviewees (Respondent 389 and 432) described brief but intensive employment of waged labour before Christmas for their turkey enterprises, and this type of farm does seem to be associated with higher than average levels of flexible labour. The farms with poultry were more likely than the average farm (50% versus 23%) to use non-family part-time labour. They were also more likely (40% versus 19%) to use seasonal and casual labour, including family (20% versus 10%)

and non-family (20% versus 5%) sources. The sample is small, but the data show a very high average number of part-time workers (1.6 per farm, of which 0.8 non-family and 0.8 family) as well as non-family seasonal and casual workers (1.8 per farm) on the farms with poultry.



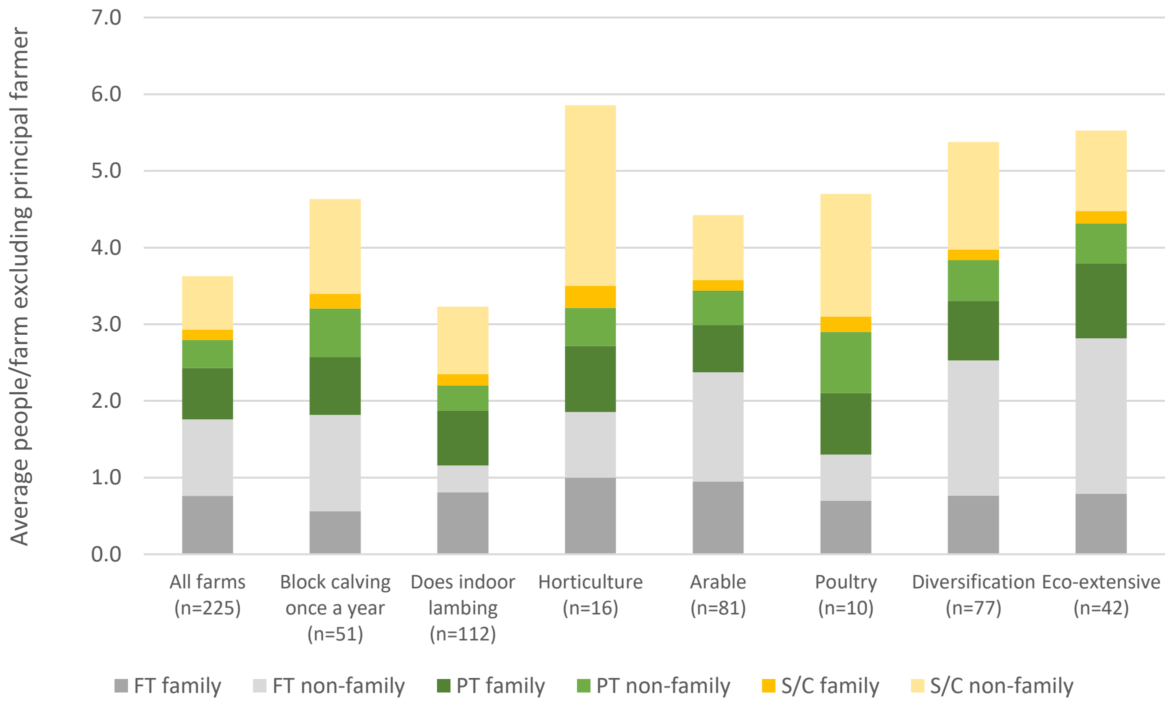


Figure A12.7. Comparison of the average 'additional' internal workforce of surveyed farms with various characteristics, by type of worker

Data source: survey dataset

FT = full time, PT = part time, S/C = seasonal or casual

Workforce is 'additional' because it is additional to the labour provided by the principal farmer, which is usually full time

Arable farming was highlighted in the interviews and literature as being peaky, with the season culminating in harvest, but is it associated with flexible labour? Almost all of the farms in the survey with arable crops (n=28) were classified as mixed farms. They were more likely than average to have used non-family seasonal or casual workers (26% of them did so, versus 5% of all farms). However, they were not more likely than the average farm to have used part-time labour (56% versus 59%) and a higher percentage of them used full-time labour (81% versus 64%; 93% versus 87% when we include principal owner). Indeed, having a high percentage of full-time labour in the workforce, be it from owners, family members or non-family sources, is positively associated with arable enterprises (p=0.016). Overall, farms with arable had close to the average number of flexible workers in the workforce. There is therefore nothing to suggest that arable enterprises use more flexible labour to a particularly large degree – perhaps some additional use of non-family seasonal labour, but probably a lot of long hours (over-employment) by existing full-time staff and agricultural contractors. Ninety-three per cent of the farms with arable used contractors, which is a little above the 88% of all farms in the survey.

These findings could support the proposal from earlier that standalone, high-value enterprises such as horticulture or poultry *create more demand* for flexible non-family labour, or at least *use more* flexible non-family labour, than aspects of core field and livestock operations such as whether the farm has arable crops or does indoor lambing. It seems possible, again induced from the interviews and other information sources, that farm businesses often either have more capital available or are more willing to hire labour for such enterprises; whereas the labour demands of core field and livestock operations, albeit peaky, are handled – not exclusively by any means, but perhaps to a larger extent – by full-time and part-time members of the workforce, who may be working long hours during those periods in a state of over-employment. That is, perhaps high-value, standalone enterprises rely more on non-family labour and numerical flexibility, and core arable and livestock production systems rely more on family labour and numerical flexibility.

If so, having a non-farming **diversification enterprise** might belong to the same category as horticulture and poultry, in the sense that it leads to greater use of employed, non-family labour, even if the demand is not necessarily temporary or seasonal. The farms in the survey with diversification reported larger workforces than average, and much of their labour was sourced from flexible sources and non-family labour in general. Diversified farms were more likely than the average farm to have employed non-family part-time workers (50% versus 23%) and non-family seasonal and casual workers (34% versus 5%), but also full-time non-family workers too (40% versus 29%).

Another farm characteristic that is associated with large workforces is being **eco-extensive**. The two are linked, since 43% (n=18) of all eco-extensive farms had a diversification enterprise. That sub-group of 18 eco-extensive and diversified farms had one of the largest average workforces of all examined groups in the survey (6.7 people/farm) and one of the largest percentages of non-family labour in that workforce (66%). Eco-extensive farms were quite likely to have used flexible non-family labour – not just part time (used by 38% eco-extensive farms versus 23% of all farms in the survey) but also seasonal or casual (26% versus 5%). But they were also more likely to use non-family full-time labour (40% versus 29%). We observe a similar, and probably overlapping, pattern, with diversification – whereby the workforces are larger than average with greater use of non-family labour overall, but not so markedly skewed towards flexible temporary labour as some other enterprise characteristics such as block calving or horticulture.

Appendix 13. Effect of farm assurance on prices of finished livestock sold at auction

Table A13.1. Prices fetched by farm assured and non-farm assured livestock at auction, 2020
Data source: AHDB (2020b)

	Midlands			South West			England			Wales		
	Average price (p/kg)		FABBL premium	Average price (p/kg)		FABBL premium	Average price (p/kg)		FABBL premium	Average price (p/kg)		FABBL premium
	FABBL	Non-FABBL		FABBL	Non-FABBL		FABBL	Non-FABBL		FABBL	Non-FABBL	
Sheep												
Prime new season lambs (SQQ)	216.6	215.6	0%	211.4	211.2	0%	218.7	212.7	3%	213.1	210.1	1%
Prime new season lambs (total)	212.9	212.2	0%	206.2	208.2	-1%	213.6	210.6	1%	210.9	208.1	1%
Cull ewes	73.3	72.2	1%	75.7	67.6	12%	72.7	70.3	3%	63.9	59.2	8%
Cattle												
Steers	199.7	190.0	5%	193.0	184.5	5%	210.1	198.5	6%	209.8	200.4	5%
Heifers	212.8	205.3	4%	192.0	177.9	8%	225.8	214.8	5%	208.9	198.1	5%
Young bulls	191.9	183.2	5%	127.9	125.6	2%	197.7	186.3	6%	180.0	182.2	-1%
Older bulls	154.3	133.3	16%	101.6	92.1	10%	147.2	134.8	9%	128.4	113.8	13%
Older steers	175.0	143.2	22%	166.4	127.0	31%	170.1	135.4	26%	183.4	163.0	13%
Older heifers	163.1	159.0	3%	163.1	128.2	27%	166.1	150.6	10%	172.4	164.6	5%
Total cattle	200.9	189.2	6%	187.6	162.4	16%	210.8	195.1	8%	204.7	192.7	6%
Cull cows	107.5	106.3	1%	97.0	93.4	4%	108.0	105.0	3%	105.8	104.3	2%

Average of four weekly averages during 15 November-12 December 2020.
SQQ = Standard Quality Quotation, covering light, medium and standard weights.
FABBL premium is expressed as average FABBL price as percentage of average non-FABBL price

Appendix 14. Correlation of connectedness variables

Table A14.1. Correlations of variables that indicate connectedness among surveyed farms

Data source: survey dataset

	Farm business			Workforce						Marketing and farm assurance schemes					
	Diversi--fication enterprise	**Contracting enterprise**	**Number of business elements**	**Non-family and contractors in workforce**	**Number of people in workforce**	**FTE per farm**	**Used contractors**	**% non-family labour in workforce**	**Used informal help**	**In supermarket or processor scheme**	**Number of farm assurance schemes**	**In Red Tractor plus another**	**In a scheme but not Red Tractor**	**Number of livestock marketing channels**	**Sells to market, wholesaler, agent or trader**
Diversifi-cation enterprise		0.096	.529**	.241**	.272**	.207**	.155*	.224**	0.114	-0.016	0.099	0.029	0.013	0.044	0.041
		0.148	0.000	0.000	0.000	0.002	0.021	0.001	0.089	0.806	0.137	0.663	0.843	0.507	0.535
Contracting enterprise	0.096		.449**	0.010	0.048	0.044	-.166*	0.022	0.117	-0.069	-0.060	-0.119	-0.109	-0.043	-0.069
	0.148		0.000	0.881	0.482	0.519	0.013	0.745	0.081	0.299	0.363	0.071	0.099	0.518	0.298
Number of business elements	.529**	.449**		.236**	.235**	.157*	-0.005	.161*	.145*	0.007	.149*	0.089	-0.049	.398**	.141*
	0.000	0.000		0.000	0.001	0.023	0.942	0.019	0.031	0.919	0.025	0.183	0.460	0.000	0.035
Non-family and contractors	.241**	0.010	.236**		.411**	.342**	.367**	.683**	0.115	.260**	.381**	.349**	-.136*	0.045	-.176**
	0.000	0.881	0.000		0.000	0.000	0.000	0.000	0.088	0.000	0.000	0.000	0.040	0.503	0.008
Number of people	.272**	0.048	.235**	.411**		.881**	0.113	.567**	0.104	.265**	.360**	.360**	-0.096	0.093	-.183**
	0.000	0.482	0.001	0.000		0.000	0.101	0.000	0.133	0.000	0.000	0.000	0.162	0.175	0.007
FTE per farm	.207**	0.044	.157*	.342**	.881**		0.077	.560**	0.106	.220**	.310**	.309**	-0.096	0.055	-.167*
	0.002	0.519	0.023	0.000	0.000		0.263	0.000	0.126	0.001	0.000	0.000	0.160	0.426	0.014
Used contractors	.155*	-.166*	-0.005	.367**	0.113	0.077		0.100	-0.004	.157*	.265**	.206**	0.071	-0.058	-0.090
	0.021	0.013	0.942	0.000	0.101	0.263		0.145	0.958	0.019	0.000	0.002	0.288	0.391	0.181

	Farm business			Workforce						Marketing and farm assurance schemes					
	Diversi--fication enterprise	**Contracting enterprise**	**Number of business elements**	**Non-family and contractors in workforce**	**Number of people in workforce**	**FTE per farm**	**Used contractors**	**% non-family labour in workforce**	**Used informal help**	**In supermarket or processor scheme**	**Number of farm assurance schemes**	**In Red Tractor plus another**	**In a scheme but not Red Tractor**	**Number of livestock marketing channels**	**Sells to market, wholesaler, agent or trader**
% non-family labour	.224**	0.022	.161*	.683**	.567**	.560**	0.100		.154*	.217**	.290**	.290**	-0.127	-0.049	-.228**
	0.001	0.745	0.019	0.000	0.000	0.000	0.145		0.025	0.001	0.000	0.000	0.064	0.481	0.001
Used informal help	0.114	0.117	.145*	0.115	0.104	0.106	-0.004	.154*		.183**	0.103	0.113	-0.032	0.022	0.056
	0.089	0.081	0.031	0.088	0.133	0.126	0.958	0.025		0.006	0.126	0.092	0.637	0.746	0.406
Supermarket or processor scheme	-0.016	-0.069	0.007	.260**	.265**	.220**	.157*	.217**	.183**		.523**	.657**	-0.079	0.043	-.171**
	0.806	0.299	0.919	0.000	0.000	0.001	0.019	0.001	0.006		0.000	0.000	0.232	0.516	0.009
Number of farm assurance schemes	0.099	-0.060	.149*	.381**	.360**	.310**	.265**	.290**	0.103	.523**		.792**	-0.055	0.120	-0.072
	0.137	0.363	0.025	0.000	0.000	0.000	0.000	0.000	0.126	0.000		0.000	0.407	0.071	0.278
Red Tractor plus another	0.029	-0.119	0.089	.349**	.360**	.309**	.206**	.290**	0.113	.657**	.792**		-0.120	0.126	-0.044
	0.663	0.071	0.183	0.000	0.000	0.000	0.002	0.000	0.092	0.000	0.000		0.068	0.058	0.506
Scheme not Red Tractor	0.013	-0.109	-0.049	-.136*	-0.096	-0.096	0.071	-0.127	-0.032	-0.079	-0.055	-0.120		0.050	-0.075
	0.843	0.099	0.460	0.040	0.162	0.160	0.288	0.064	0.637	0.232	0.407	0.068		0.451	0.260
Number of livestock marketing channels	0.044	-0.043	.398**	0.045	0.093	0.055	-0.058	-0.049	0.022	0.043	0.120	0.126	0.050		.310**
	0.507	0.518	0.000	0.503	0.175	0.426	0.391	0.481	0.746	0.516	0.071	0.058	0.451		0.000
Market, wholesaler, agent or trader	0.041	-0.069	.141*	-.176**	-.183**	-.167*	-0.090	-.228**	0.056	-.171**	-0.072	-0.044	-0.075	.310**	
	0.535	0.298	0.035	0.008	0.007	0.014	0.181	0.001	0.406	0.009	0.278	0.506	0.260	0.000	

Statistical methods used vary depending on the nature of the variables (see section 2.3.2.3). Where correlation is significant at 0.01 (**) or 0.05 (*) level, such values are highlighted (positive correlations in green, negative correlations in yellow).

Table A14.2. Indicators of connectedness correlated with farm type and other farm characteristics

Data source: survey dataset

	Farm business			Workforce						Marketing and farm assurance					
	Diversi--fication enterprise	Contracting enterprise	Number of business elements	Non-family and contractors in workforce	Number of people in workforce	FTE per farm	Used contractors	% non-family labour in workforce	Used informal help	In supermarket or processor scheme	Number of farm assurance schemes	In Red Tractor plus another	In a scheme but not Red Tractor	Number of livestock marketing channels	Sells to market, wholesaler, agent or trader
Dairy	-0.039	-0.009	-0.006	.301**	.354**	.427**	.150*	.378**	0.059	.379**	.276**	.318**	-0.056	.148*	-.192**
	0.557	0.896	0.934	0.000	0.000	0.000	0.024	0.000	0.382	0.000	0.000	0.000	0.401	0.025	0.004
LFA	-.131*	-0.018	-.172**	-.205**	-.143*	-0.130	-.228**	-.242**	-0.037	-0.058	-0.090	-.133*	0.041	0.091	0.095
	0.048	0.788	0.009	0.002	0.037	0.057	0.001	0.000	0.587	0.384	0.173	0.044	0.539	0.173	0.153
Lowland	0.034	-0.045	-.233**	-.252**	-.200**	-.202**	0.038	-.188**	-0.016	-.196**	-.193**	-.159*	0.068	-0.059	0.003
	0.605	0.493	0.000	0.000	0.003	0.003	0.576	0.006	0.814	0.003	0.003	0.016	0.307	0.377	0.961
Mixed	0.129	0.058	.397**	.155*	0.022	-0.053	0.092	0.047	0.022	-0.089	0.117	0.019	-0.022	-0.097	0.069
	0.052	0.381	0.000	0.018	0.743	0.436	0.169	0.498	0.741	0.178	0.075	0.774	0.735	0.146	0.300
Small-holding	-0.064	-0.024	-0.107	-0.121	-.141*	-.145*	-.186**	-0.116	-0.059	-0.089	-.310**	-.135*	-0.040	-.141*	0.059
	0.335	0.722	0.110	0.068	0.039	0.034	0.005	0.091	0.382	0.180	0.000	0.040	0.541	0.034	0.371
Area farmed (ha)	.140*	0.056	.132*	.225**	.291**	.355**	0.031	.447**	-0.024	0.035	.259**	.176**	-0.065	0.022	-0.059
	0.036	0.398	0.049	0.001	0.000	0.000	0.651	0.000	0.727	0.603	0.000	0.008	0.333	0.744	0.375
Eco-extensive	0.087	-0.089	0.075	.152*	.191**	.178**	.140*	.141*	-0.018	-0.007	.599**	.546**	.279**	0.076	0.000
	0.193	0.179	0.263	0.021	0.005	0.009	0.037	0.040	0.786	0.920	0.000	0.000	0.000	0.253	0.996

Statistical methods used vary depending on the nature of the variables (see section 2.3.2.3). Where correlation is significant at 0.01 (**) or 0.05 (*) level, such values are highlighted (positive correlations in green, negative correlations in yellow).

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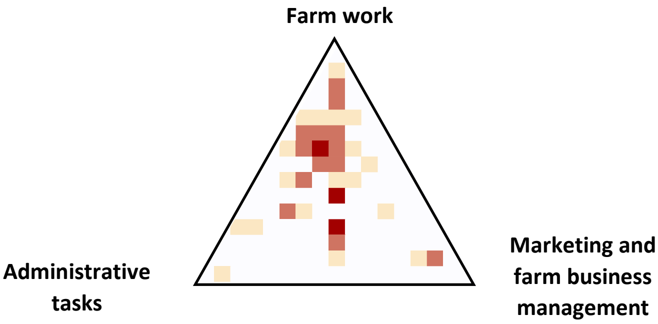
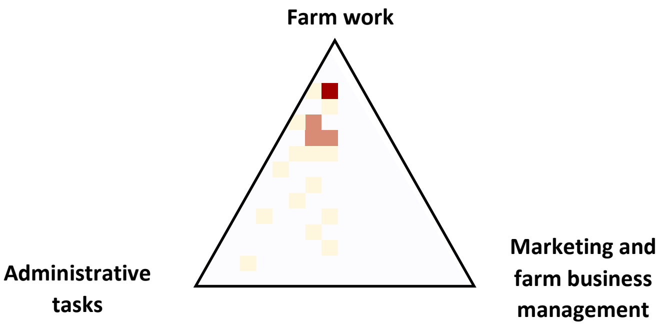
Appendix 15. Triangles

Each triangle shows where survey respondents of a particular characteristic drew a dot to show where they personally balanced their time between farmwork, administrative tasks, and marketing and farm business management. The more respondents marked a spot in a location, the darker the red.

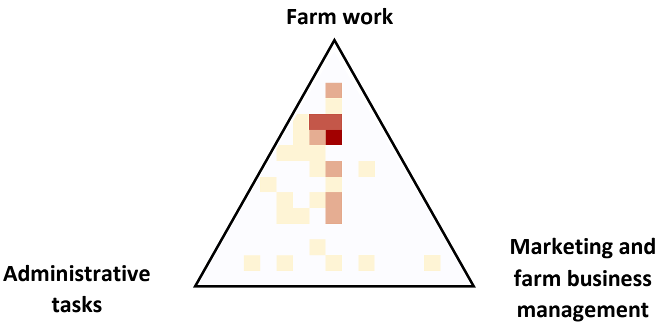
Dairy (*n*=53)



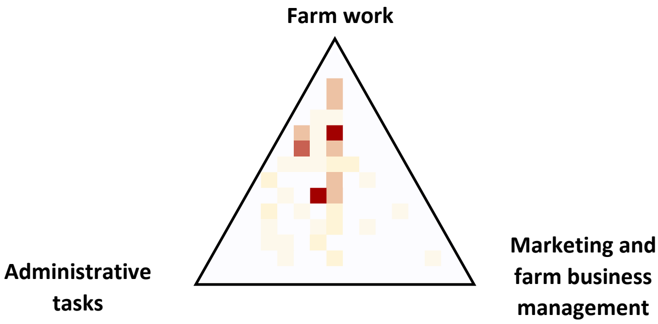
LFA (*n*=29)



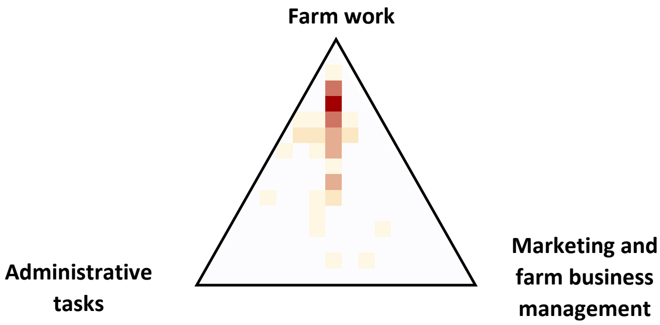
Eco-extensive (*n*=40)



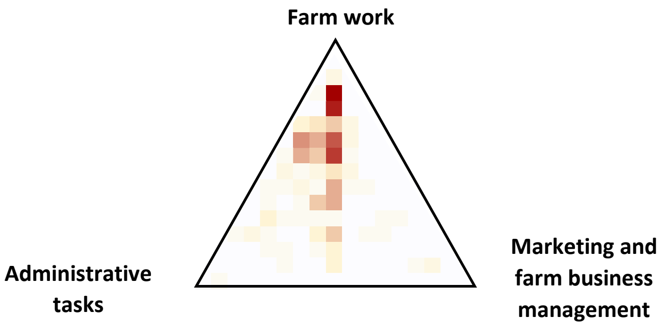
Mixed farm (*n*=66)



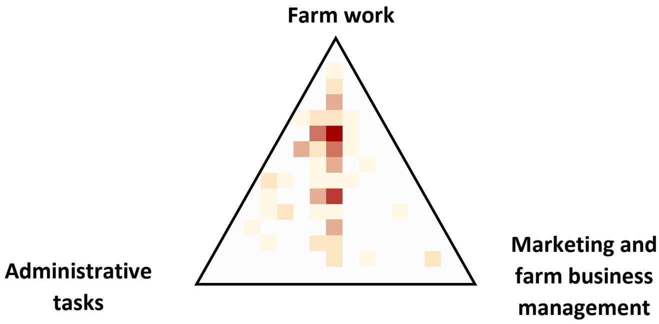
Lowland (*n*=45)



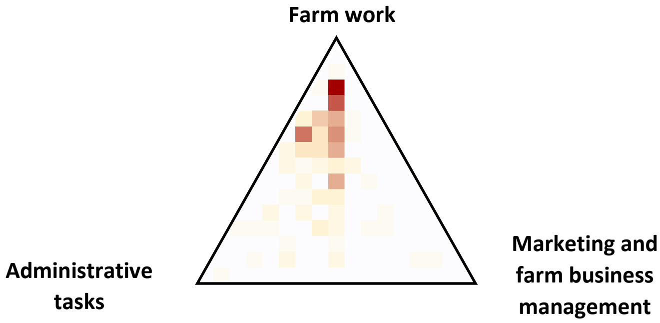
Non-eco-extensive (*n*=162)



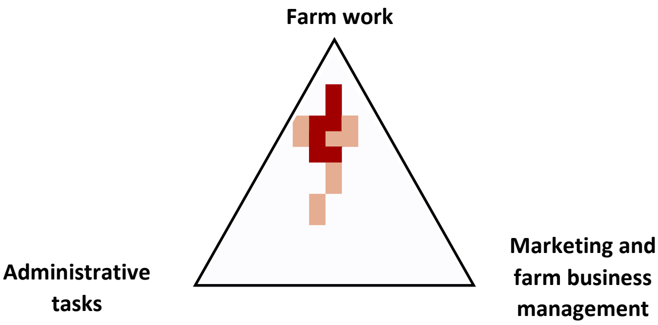
Has a diversification enterprise (*n*=73)



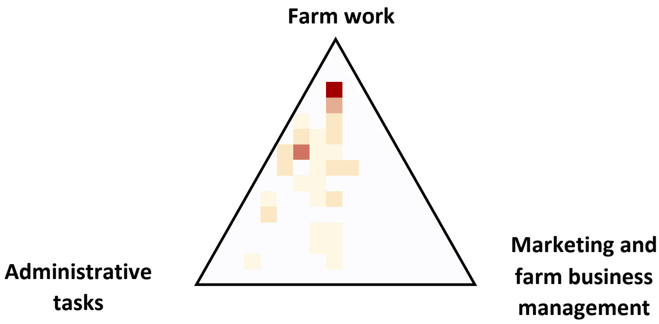
No diversification enterprise (*n*=129)



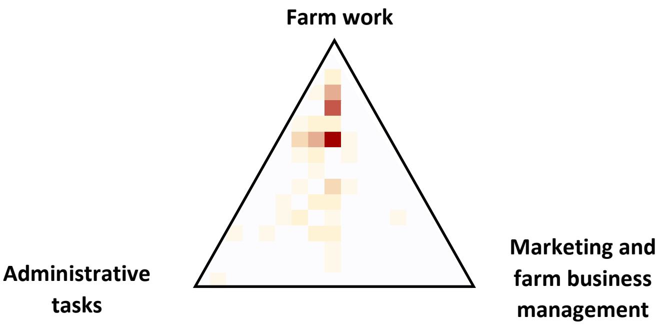
20–49ha (*n*=23)



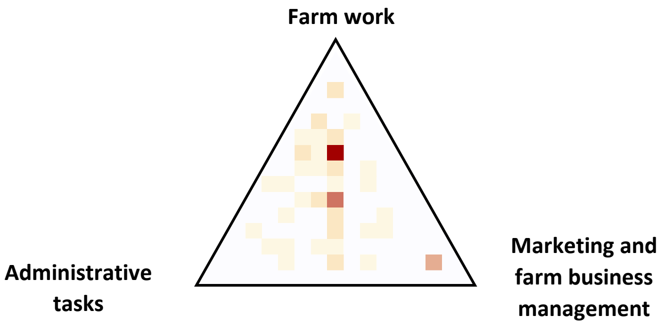
50–99ha (*n*=46)



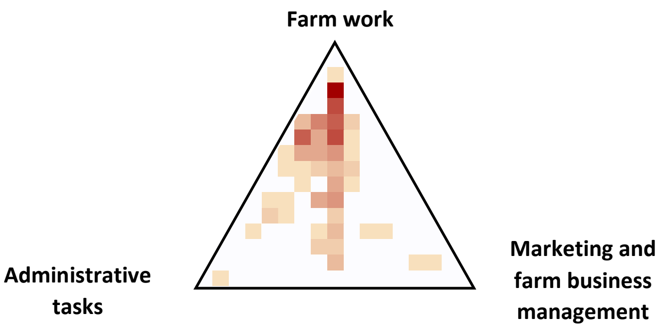
100–199ha (*n*=63)



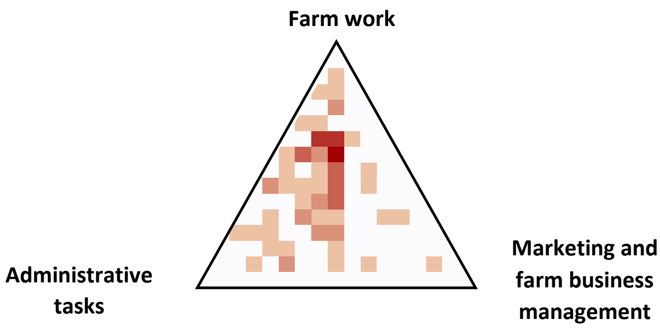
≥200ha (*n*=55)



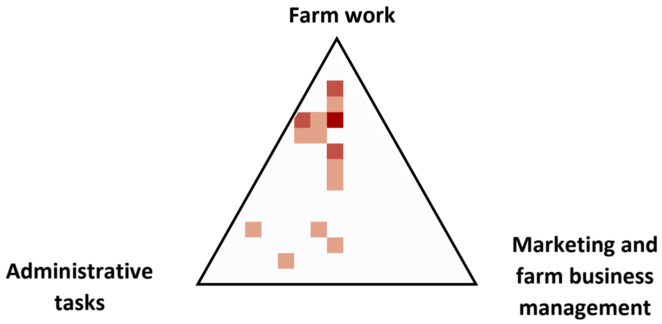
Paperwork is manageable (*n*=127)



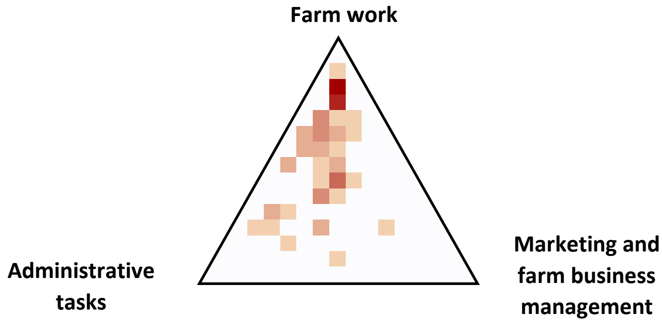
Paperwork is excessive (*n*=72)



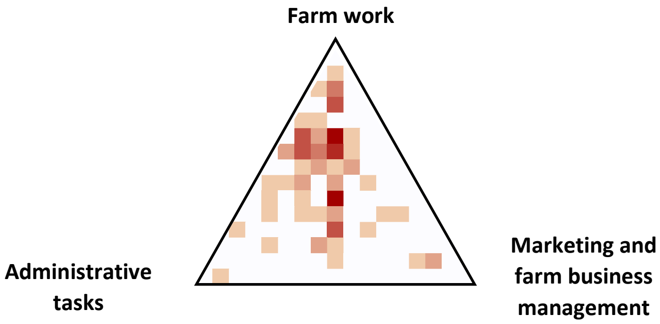
Requirement schemes: 0 (*n*=19)



Requirement schemes: 1 (*n*=58)



Requirement schemes: 2 (*n*=82)



Requirement schemes: 3 or more (*n*=43)