University of Reading

Understanding the Drivers of Smallholder Contract Participation and Compliance in Nigeria's Tomato Processing Markets.

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By

Umar Shehu Umar

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Abstract

The study aims to enhance contract performance at farmer–processor interaction. The Dangote Tomato Processing Plant (DTPP) was investigated as a case study, the largest functional processing plant with over 10,000 contract farmers. To achieve its specific objectives, the study uses mixed research methods comprising in-depth Interviews, focus groups, as well as binary and ordered logistic models. The manager of DTPP and three traders identified by snowballing techniques were interviewed. Ten farmers were recruited in each of the four selected catchment areas of DTPP for focus group discussions. The novel transaction-level data were collected from 300 random contract farmers every time they made a sale throughout the 2021 dry season harvest period, covering over 1306 transactions. The qualitative data established that the cost of entry into the processing market, delayed harvest delivery, payment arrangement, and perceived uncertainties over the company's prospects impede farmers' contract participation. The binary logistic regression results revealed that open fresh market prices and payment delays negatively affect farmers' compliance behaviour. The ordered logistic regression results revealed that, while COVID-19, Anchor Borrower Program and delayed transactions payment widened farmers' expected–observed compliance gap, resource provision, and bonuses minimized farmers expected–observed compliance behaviour gap. The study concludes that contracts may perform better if contracting agribusinesses developed an organized schedule of harvest collection, devise a reliable and timely payment plan, and introduce incentives in the contract. At the same time, government policies that aim to enhance contracts may do better if they continue to pay more attention to providing improved seeds, extension, and other services critical to the agro-processing market. Although the findings of this study could be applied to other contracting agribusiness firms, further study is needed to enforce the findings.

Declaration of Original Authorship

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

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List of Abbreviations

ABP – Anchor Borrower Program

CF – Contract Farming

DTPP – Dangote Tomato Processing Plant

FGD – Focus Group Discussion

HH – Household Head

IIP – In-depth Interview with Processor

IIT – In-depth Interview with Trader

IT – information Technology

KNARDA – Kano Agricultural and Rural Development Agency

KRIP – Kano River Irrigation Project

LGA – Local Government Area

LPO – Local Purchase Order

N – Naira

NATPAM – National Association of Tomato Growers, Processors and Marketer

RUT – Random Utility Theory

RQ – Research Question

SDG – Sustainable Development Goals

TCE – Transactions Costs Economics

TE – Technical Efficiency

1 Understanding the Determinants of Smallholder Contract Participation and Compliance in Nigeria's Tomato Markets

1.1 Introduction

Globally, agro-processors and marketing agribusiness firms adopt contract farming (CF) as an exchange mechanism to strengthen vertical coordination in their agrifood chains (Mugwagwa et al., 2020). This coordination mechanism brings various production units under one control unit (Peterson, 2001; Williamson, 1971). The terms contract and CF are used interchangeably in the literature. A contract is a broad concept which refers to a voluntary agreement between two economic agents that both accept they should fulfil (Fafchamps and Minten, 2001) and (Macneil, 1978). In contrast, CF is a new agricultural institution focused on a future supply agreement between a grower and a processor or marketing agribusiness firm (Ton et al., 2018). According to Bellemare and Lim (2018), CF is not an unbending institution; it takes several hybrid forms between the spot market and full vertical integration. Market specifications, contractual provisions, and production management determine the form that the contract farming arrangement assumes (Schepker *et al.*, 2014). In the context of this thesis, CF is a preharvest arrangement between farmers, who supply agricultural produce, and buyers, with agreed terms that specify the quality the buyer wants and the price they will pay (Bellemare, 2010).

CF is an old practice that existed long ago in the agricultural sector of developed economies, and its application is not specific to any sector of agriculture (Hu, 2013). However, it is more commonly used for perishable agricultural commodities such as milk, fruits, and vegetables supplied to processing companies (Jia and Bijman, 2013). Perishable commodities like vegetables are labour–and capital–intensive, and most farmers in this sector hardly invest in quality enhancement when there is no guaranteed market (Cadilhon *et al.*, 2006). Similarly, in developing countries where production is hugely fragmented and transactions are typically low volume (Fafchamps, 2004), CF was postulated to be a new agricultural development innovation that can enhance the performance of agricultural markets and remove market imperfections (Olomola, 2010). However, whether this postulation is true for CF in developing countries is still being debated in the literature.

The recent proliferation of modern retail markets in the urban areas of developing countries and the change in consumer demand in the market economy has established a standard for food safety and quality along the supply chains which cannot be met through spot market exchange (Cadilhon et al., 2006). Under spot market arrangements there is no advanced information sharing among the exchange agents (Omamo, 2007). Therefore, agro-processors, modern retail markets, and other agribusiness firms began to recognize CF as an efficient transaction coordination mechanism to integrate and position themselves well in the global agrifood chains (Swinnen and Maertens, 2007). Moreover, the continuing removal of international trade barriers that allow the movement of agricultural produce across borders necessitated the use of CF among exporters to meet consumers' expectations in industrialized countries (Chikazunga and Paradza, 2012).

In the literature, CF played three critical roles for farmers. Firstly, risk management, CF reduces production risks and the risks associated with spot markets, such as; market instability and price volatility (Lu et al., 2017), (Mishra *et al.*, 2018), (Bezabeh *et al.*, 2020), and (Ruml, 2020). Farmers lack effective risk management strategies, technical skills, technology, and financial strength needed to produce a high-quality commodity that meets the expectations of the high–paid markets (Bellemare, 2010). CF mitigates these risks and challenges. Apart from providing farmers access to resources and technical services, CF provides compensation in case of crop failure (Bellemare and Bloem, 2018). Moreover, farmers under CF benefit from guaranteed market access and price (Eaton and Shepherd, 2001),(Fehr *et al.*, 2009), and (Luo *et al.*, 2013), which help stabilize their income (Barrett *et al.*, 2012) and (Bellemare, 2010), and enhance their welfare (Tefera *et al.*, 2020).

Secondly, CF reduces transaction costs. It minimizes all the costs of searching, monitoring, and uncertainty associated with the spot market (Williamson, 1985a). CF allows the economic agent involved in a transaction to decide about the resource allocation that resonates with the needs and interests of the other agent (Ajwang, 2020) and (Woldie and Nuppenau, 2011). Thirdly, it improves the production efficiency of the farmers (Mishra et al., 2018), (Mpeta et al., 2018), and (Bidzakin et al., 2020). Some CF arrangements provide extension and technical services that enhance the farmers' production efficiency (Mishra et al., 2018). Similarly, for the processors, CF helps secure suitable quality raw materials and minimizes risks associated with production and labour (Bellemare and Lim, 2018).

However, CF performance for agro-processors in developing countries is low due to poor contract participation (Kutawa, 2016) and (Guo et al., 2007). The majority (about 90%) of the farming population in developing countries are smallholder farmers (Phiri *et al.*, 2019), and they are being constantly pinned down by inadequate returns to make a beneficial investment, low-intensity, poor yield, and subsistence-oriented production (Meemken and Bellemare, 2019). These limitations make it difficult for them to integrate themselves into the agro-processing market because of the core requirements of safety and quality standards (Escobal and Cavero, 2012). These conditions leave the less endowed farmers with the only option of producing and selling their produce to traders or other buyers on their farms or at the local markets where such quality and safety standards are not core conditions for buying and selling (Scott and Center, 1995) and (Blandon et al., 2010).

Moreover, CF performance is affected by an excess breach of contract among contract farmers, which is inevitable in developing countries (Zhang and Aramyan, 2009). Market economies in developing countries are characterized by information asymmetries, which give rise to moral hazard and adverse selection that generate contract compliance problems for processors and contracting agribusiness firms (Fehr *et al.*, 2009). Most farmers do not take the contract seriously and find breaching it easy (Luo *et al.*, 2013), which may be because contracts are primarily verbal and have no written code of conduct (Fafchamps, 2004). Again, contracting firms find it challenging to use the court to enforce the contract because of its enormous cost, time–consuming, and consequences on their business reputation (Fehr et al., 2009).

Good CF performance is indispensable for the survival of every agricultural supply chain (Cai and Ma, 2015). Most agro–processors in developing countries rely significantly on the contracted supply of raw materials to meet their economies of scale (Lu et al., 2012) and (Yang et al., 2012). Therefore, when processors cannot secure an adequate quantity of raw materials due to low recruitment of farmers under their contract scheme and excess breach of contract, they may have to resort to outsourcing in the spot market to meet their economies of scale. This outsourcing increases their transaction costs by exposing them to more risks and uncertainties, which may affect their ability to compete profitably with the international price in the domestic market. As a result, the processing company may not

survive long, and this will directly affect the jobs created along the supply chain, which is hostile to economic growth and development.

Furthermore, poor contract participation and compliance among smallhoder farmers in developing countries may not be unconnected with the role played by market intermediaries to make Tomatoes available in the urban space. In the majority of the developing countries, the market system in the agriculture sector is controlled by the intermediaries and their role is quite exploitative (Mazengo, 2014). As observed by Fafchamps (2001) most farmers cannot afford to buy production inputs, and the tough borrowing conditions of financial institutions make their situation worse. However, they can get loans from the intermediaries to cover production costs, which is to be paid in form of produce (Möller-Gulland and Donoso, 2016). Thus, most farmers may prefer producing for open market and those contracted may easily break the contract to satisfy the intermediaries because of the financial relationship they have with them.

Generally, all developing countries are working towards achieving zero levels of poverty to enhance the welfare of their citizens, which is Sustainable Development Goal One (SDG 1) (Ahmad and Ahmad, 2021). Development experts and governments of developing countries recognize CF as a viable development instrument that connects smallholder farmers to the market, thereby reducing poverty (Jia and Bijman, 2013), (Meemken and Bellemare, 2019) and (Barrett et al., 2012). Farmers' inability to overcome barriers to the agro-processing market may propel them to an extreme poverty level (Bellemare, 2010), therefore, this study considers enhancements to contract performance in Nigeria, focusing on contracts at the tomato farmer – processor interaction.

1.2 Background of the Study

Recently, developing countries of the world witnessed rapid restructuring in food demand due to the proliferation of modern agro-processing firms and the emergence of modern retail markets in the urban areas, which brought about many new opportunities for farmers and other stakeholders along the value chain (Jia *et al.*, 2014). The emergence of processing plants is seen as a symbol of economic growth and an opportunity to convert harvest losses, especially in developing countries' fruit and vegetable sectors (Adegbola et al., 2012). In Nigeria, it was estimated that about 50% of the tomatoes produced by farmers could not

make it to market (Plaisier *et al.*, 2019), and, in addition to price volatility, farmers in the tomato sector are continually being exposed to the risk of harvest losses due to market imperfection (Abimbola, 2014). Thus, the emergence of processing plants is assumed to be a turning point for farmers in the tomato sector.

Robinson and Ngeleza (2011) found that in Ghana, like many other African countries, there are two parallel markets for tomatoes governed by a different set of contractual rules. These markets are agro-processing and open fresh or local markets (in rural and urban areas). The open markets are usually dominated by itinerant traders who are the major buyers of tomatoes in the rural production area that make them available in the urban space. Similarly, in Nigeria, tomato farmers can sell to processors at a fixed contract price under specified contractual terms that a farmer must accept prior to harvest for the exchange to take place (Kutawa, 2016). Alternatively, a farmer may sell to traders or other buyers in the local market where the price is uncertain. Unlike in the agro-processing market, under this trader or spot market exchange, there is no prior arrangement between exchange partners.

Most farmers have less interest in agro-processing markets because of their complex transaction requirements (Escobal and Cavero, 2012) and those that engaged with agro-processing markets are often opportunistic (Luo *et al.*, 2013). These challenges affect the agro-processor's ability to produce and compete profitably in the domestic market. For example, recently in Nigeria, the Dangote Tomato Processing Plant (DTPP) was established with the expectation to provide market opportunities to over 10,000 farmers, cut off importation, and contain over 900,000 tonnes of fresh tomatoes lost annually to lack of processing and storage facilities (Adegbola *et al.*, 2012) and (Abimbola, 2014). The DTPP is the largest of its kind and can process 350 million tonnes per season and 1,200 tonnes of tomatoes per day. However, due to poor supply and multiple breaches of contract, this company is non-profitable as it can only secure and process, at most, 20% of its capacity.

A body of literature has established that transaction costs, which arise from asset specificity, are one of the critical barriers to contract participation in agro-processing market contracts (Key *et al.*, 2000), (Alene *et al.*, 2008), (Woldie and Nuppenau, 2011), (Escobal and Cavero, 2012) and (Ajwang, 2020). Most processing industries have a specific quality requirement critical to processing and production activities. For instance, the percentage of soluble solids (known as the degrees of Brix), determined by variety, is critical to tomato processing

industries (Robinson, 2012). Tomato sweetness is an essential subjective criterion that buyers and consumers use to assess the quality of the tomato product (Zanor et al., 2009), which is determined by the percentage of soluble solids (degrees of Brix). Thus, farmers willing to enter the agro-processing market must invest in high–quality seeds and other related technologies that give high degree of Brix. Many of them can either, not afford to, or are unwilling to, commit themselves to producing a commodity whose alternative value may be low (Goodhue et al., 2010).

Escobal and Cavero (2012) found that farmers' socioeconomic endowment dramatically influences their decision to participate in the agro-processing market. For example, less educated, poor, and inexperienced farmers are less likely to participate in the contract because they cannot deal with the complexities of the contractual opportunities. Similarly, Ton *et al.* (2018) and Meemken and Bellemare (2019) found that most contracting agribusiness firms in developing countries exclude farmers with small landholdings because they cannot produce commercially.

Evidence shows that some contracts are production contracts, which provide farmers access to resources and services (Cai and Ma, 2015). The provision of resources and services in the contract attracted resource-poor farmers hindered by private input provisions to participate in the contract (Eaton and Shepherd, 2001) and (Fehr *et al.*, 2009). Similarly, some farmers were attracted to contract farming because of the support programs that aim to integrate smallholder farmers into the agro-processing markets (Kumar et al., 2013). These programs provide farmers access to resources and extension services necessary for producing high–quality products that will meet the needs of agro-industries. Currently, the Federal Government in Nigeria has introduced an Anchor Borrower Program (ABP) that aims to facilitate the growth of local agro-processing industries and integrate smallholder farmers into large-scale agro-processing companies. This program attracted many farmers to CF. The program provides funding to large-scale processing companies called *Anchors* based on the agreement that they will uptake tomatoes from smallholder farmers at a price pegged by the Government. As part of the requirements, a farmer must be a member of a registered farmer association or cooperative society and accept the *Anchors*' contract's terms in writing.

Moreover, a contractual breach is inevitable among the contracting parties because of the *Homo economicus* nature of the economic agents (Woldie and Nuppenau, 2011).

Although contractual breaches occur from the contracting agribusiness firms, a body of literature have shown that contractual breach is often from the farmers' side and rarely from the contracting agribusiness firms (Kumar, 2008), (Zhang and Aramyan, 2009), and (Luo *et al.*, 2013). Contractual breaches come in two ways: one is side-selling, the most common in resource-providing contracts – where farmers conceal the contracted quantity of produce and sell it outside the contract (Guo *et al.*, 2007a); the other is delivering low-quality raw materials (MacLeod, 2007), where farmers supply below the quality agreed upon.

Contract enforcement in developing countries is rarely possible (Falk et al., 2015). Most contracting firms cannot use the court to deal with defaulters, they often use incentive instruments to enforce the contract informally (MacLeod, 2007). For example, penalties and bonuses introduced in the design of contracts were found to positively influence farmers' level of contract compliance (Godoy and Bennett, 1990), (Cadilhon et al., 2006), (Saenger et al., 2013) and (Falk et al., 2015) and (Luo *et al.*, 2013). Contracting firms may use bonuses and penalties instead of hugely costly court action. Bonuses encourage good behaviour among loyal farmers, while penalties increase the cost of breaking the contract, discouraging bad outcomes among farmers.

Literature has shown that where formal enforcement mechanism is ineffective, mainly where farmers produce independently with little or no involvement of the contracting firms in the production process, price premiums can be a helpful tool for incentivizing compliance among the contracted farmers (Ton *et al.*, 2018) and (Rosch and Ortega, 2019). The price premium encourages farmers to rely more on the contracting agro-processing firm and make an effort to invest more in quality enhancement. Moreover, some contracting firms instead use price penalties or rejection to deal with the farmers that supply low–quality products to encourage them to invest in high-quality in the future (Tefera et al., 2020).

The open market price creates unanticipated rent that makes the contracting companies vulnerable to contractual breach (Kumar *et al.*, 2013). In Ghana, for example, Robinson and Kolavalli (2012) found that, even if tomato farmers are profitable in complying with the contract, they always have the option of breaking the contract provided the fresh market remains. Similarly, in Nigeria, a parallel trader market exists. Most traders are itinerants, going around the country with their trucks looking for tomatoes to buy (Adepetu, 2012). These traders usually keep their price higher than the contract price and remain profitable supplying

the urban markets. As a consequence, most contracted tomatoes are directed towards the more profitable open fresh market, leaving the processing industries short of supply.

Moreover, sometimes the unanticipated rent created by the open market price is not the main reason why farmers break contract. For instance, in Nigeria and other developing countries farmers may break the contract and sell the contracted produce outside the contract at same or relatively lower price (Lu et al., 2012). This irrationality may not necessarily be because of the naivety of the farmers but the influence of market intermediaries (Robinson and Ngeleza, 2011). Majority of the farmers felt so much indebted to intermediaries that often help them with loan to cover their production costs (Adepetu, 2012); therefore, they find it easier to break contract and sell their tomatoes to the market intermediaries at a price that is lower or equal to the contact price.

Transaction costs, such as transport costs or distance to market, affects farmers' compliance behaviour, as most are overly sensitive to additional costs after harvest (Arah *et al.*, 2015). Regardless of the contract price, farmers often sell to markets with low transactional costs (Osebeyo and Aye, 2014). Similarly, Saenger *et al.* (2013) and Fathelrahman *et al.* (2017) attributed contractual breaches among farmers to high transfer costs. Again, Cai and Ma (2015) found that distance to market negatively affects contract enforcement choice among farmers. Therefore, farmers may easily break contracts and sell to traders that often come to their farms during harvest looking for tomatoes to buy. In Nigeria, these traders often come with their trucks and pay for the cost of loading.

Dhillon and Singh (2006), examining the problems, challenges, and opportunities associated with contract farming, found that farmers often act dishonestly believing that they are being exploited because of the firms' quality standards that require high production costs. This belief has a negative influence on most farmers. They often mimic being honest, conceal the actual quantity of the output, sell the more significant proportion to the market that pays a high price and supply the remaining proportion to the contracting firm as a bond representing their contractual obligation (Luo *et al.*, 2013) and (Cai and Ma, 2015).

Contractual provisions play a vital role in farmers' contract compliance decisions. Some contracts provide farmers with access to resources and services otherwise unavailable to them (Luh, 2020). In their study on contract enforcement, Cai and Ma (2015) found that

resource provision has a significant positive impact on farmers' choice of contract enforcement. Similarly, Kumar *et al.* (2013), in their investigation of contract arrangement and enforcement, found that farmers tend to do better when the contracts provide them with access to resources and services. Thus, many of the farmers who are constrained by private input provisions will perform better within the contract to avoid missing contractual opportunities in the future.

Literature has recently established that economic activities at small and medium businesses face severe challenges due to the COVID–19 pandemic (Hailu, 2020). Evidence has shown that the COVID–19 pandemic disrupted the agricultural supply chain (Barman et al., 2021), affecting consumer purchasing behaviour (Oyewale et al., 2021). Chen and Yang (2021) found that the COVID–19 pandemic massively shrinks the sales of agricultural by-products and shortens the sales of by-products of giant agricultural firms. Moreover, Martinez *et al.* (2021) explore the effects of the COVID–19 pandemic on the demand and supply of cattle and beef in the United States. They found that the shutdown of food retail points, services, and restaurants has slowed the demand for beef; at the same time, the gradual closure of meat processing points results in the jamming of live cattle in the supply chain, which leads to a low price of cattle and poor flow of cattle supply along the supply chain. Tomato processing markets may also not be an exception from the effect of the COVID–19 pandemic.

1.3 Problem Statement

In the literature, most studies on CF pay more attention to the level of contract acceptability/participation among farmers to evaluate CF performance (Guo et al., 2007). Numerous studies investigated the determinants of contract participation among smallholder farmers in developing countries. For example, a body of literature investigated the effect of transaction costs on farmers' decision to participate in the contract, particularly the costs associated with entry into the market (Escobal and Cavero, 2012), (Key *et al.*, 2000), (Alene *et al.*, 2008), (Woldie and Nuppenau, 2011) and (Osebeyo and Aye, 2014a). While Kumar (2008), Repar *et al.* (2018), Blandon *et al.* (2010), and Ruml (2020) investigated the effect of contractual provisions on farmers' contract participation choice. Moreover, Kutawa (2016), Vassalos and Li (2016), Sahara *et al.* (2015), Zhang *et al.* (2017), and Abate *et al.* (2021) examined the effect of household characteristics on farmer contract participation among

farmers. Nonetheless, further investigation on CF determinants remains relevant, given the varying nature and forms that CF assumes across firms in developing countries (Bellemare and Lim, 2018).

Notably, farmers' level of contract compliance is a critical indicator of CF performance which determines the sustainability of the ongoing bilateral relationships along the entire agricultural supply chain (Cai and Ma, 2015). In the literature, little attention is paid to farmers' contract compliance behaviour, and although some studies have been conducted on contract compliance, there are still some gaps. For example, Kumar *et al.* (2013) investigated the effect of contractual provisions on farmers' contract performance. Cadilhon *et al.* (2006), Saenger *et al.* (2013), and Luo *et al.* (2013) investigated the effect of incentives, specifically bonuses/rebates and penalties, on contract compliance among farmers. Rosch and Ortega (2019) examined the role of price premiums in enforcement contract compliance. Cai and Ma (2015) evaluated the effect of transaction costs on farmers' contract enforcement choices. However, these studies on contract compliance pay less attention to transaction-level attributes, and the existing findings may only be valid for some study areas. Thus, further investigations on contract compliance remain relevant, given the varying dynamics across countries.

In addition, literature maintains a common conclusion that people hardly actualize what they intend to do, resulting in a behavioural intention–action gap (Sheeran and Webb, 2016) — also known as the expected-observed behaviour gap. There are several studies on the behavioural intention–action gap. For example, Rhodes and de Bruijn (2013), in their investigation of intention–action gap in physical exercise, discovered that reasonable percentage of the non-intenders of exercise ended up doing the activity, while significant proportion of the intenders were unable to do the exercise. Similarly, Moghavvemi *et al.* (2015) found that some exogenous variables, such as resource availability and new contract opportunity, influence the relationship between intention and use behaviour among the users of information technology (IT) in Malaysia. Qi *et al.* (2020), in their investigation of the effects of COVID–19 on the intention–action gap among green food buyers, found that panic, unavailability, and price issues arising from COVID–19 widen the consumers' intention–action gap. However, no study measures the intention–action gap relating to contract compliance behaviour, which this study referred to as expected–observed compliance behaviour gap.

Therefore, this study to the best of the researcher's knowledge and peer group is the first to investigate the determinants of expected–observed compliance gap among contracted farmers.

Furthermore, in the literature, the intention is often assumed to be a proximal indicator of behaviour (Frank and Brock, 2018). Most contract compliance studies rely on farmers' self-reported compliance in the household survey or aggregated data to capture compliance. For instance, Luo *et al.* (2013) use self-reported compliance measured on a Likert scale to investigate contract compliance. This Likert scale may be misleading and may not correctly capture farmers' expected or intended compliance as it may introduce bias. Kumar (2013) and Cai and Ma (2015) use aggregated transaction data to evaluate farmers' contract enforcement choices. The aggregated supply data may not reveal the exact compliance level as farmers that produce on a large scale and has a low compliance level may supply an amount higher than the farmers who produce on a small scale and supply 100%. Therefore, to the best of the researcher's knowledge, this study is the first to combine the survey and transaction level data to measure and compare reported and observed compliance behaviour. A combination of these data may provide more reliable information for policy considerations.

Studies like Oyewale *et al.* (2021) have shown that unforeseen events like the COVID–19 pandemic affect businesses and prices worldwide. Increasing the price of agricultural products may create unanticipated rent, which may affect farmers' compliance and actions. However, no evidence exists regarding the effect of the COVID-19 pandemic on farmers' CF participation, compliance, or expected–observed compliance behaviour gap.

1.4 Research Questions and Specific Objectives

1.4.1 Research Questions

The study asked the following Research questions (RQs) to address the existing gaps in the literature:

1. How do tomato farmers choose between Processor and Trader contracts?
2. What drives contract compliance behaviour at the farmer–processor interaction?
3. What factors influence the expected–observed compliance behaviour gap among farmers contracted by the Processor?

1.4.2 Specific Objectives

The specific objectives of the study are to:

1. Understand contract arrangements in processor and trader markets, and explore factors that motivate farmers to participate in Tomato Processor's contract,
2. Determine the effect of socioeconomic characteristics, transaction costs, open market price, and resource–provision on farmers' contract compliance behaviour,
3. Examine the influence of transaction costs, COVID–19, bonuses, resource–provision, and the Anchor Borrower Program (ABP) on farmers' expected–observed compliance behaviour gap.

1.5 Contribution

The current study uses mixed research approaches to bridge and expand the existing knowledge on CF, specifically contract participation, compliance, and expected–observed compliance behaviour gap. The methodology chapter will discuss the study's choice of these methodological approaches.

Firstly, the study contributes to the debate regarding the role of transaction costs on farmers' CF participation choices. Many studies argued that transaction costs arising from the risks and uncertainties associated with the spot market that farmers often face could be mitigated or drastically minimized through CF arrangements. Also that contractual arrangements could be considered a source of uncertainties for farmers willing to participate in agro-processing contract. Therefore, the study explores and discusses the uncertainty factors arising from the contractual arrangement to inform contract design better.

Secondly, the study contributes to the ongoing debate in the literature on the role of ex-post transaction costs on farmers' contract compliance behaviour. Previous studies on contract compliance indicate a common consensus that transaction cost negatively impact on farmers' contract compliance behaviour. However, this study was the first to discover and explain the positive effect of ex-post transaction costs on farmers' compliance behaviour, which contradicts the consensus reached by the existing literature on farmers' contract compliance behaviour. This study attempts to clear this bad name attributed to transaction costs.

Thirdly, although Sheeran and Webb (2016b) identified that people often end up doing contrary to what they intend to do, to the best of the researcher's knowledge, this study was the first to extend the study of contracts beyond just contract participation and compliance to provide empirical evidence regarding farmers intention action–action gap that the study referred to as expected-observed compliance behaviour gap. The study discusses the effects of some key factors on farmers' expected–observed compliance behaviour gap and how they will help to inform policies that aim to enhance contracts.

Fourthly, many studies rely on aggregated transaction data or self–reported survey questions to capture contract compliance, which could be misleading. To the best of the researcher's knowledge, and a thorough search of the peer-reviewed literature, this study is the first to use novel transaction–level data merged with the household survey to examine the determinants of contract compliance among contract farmers. The study captures a piece of transaction information from farmers every time they made sales for one complete harvest season. The data provides an opportunity for the study to accurately capture farmers' contract compliance at the transaction and household levels.

Fifthly, to the best of the researcher's knowledge and thorough search of peer-reviewed literature, the study was the first to provide empirical evidence on the effect of the COVID-19 pandemic on farmers' attitudes towards a contract. The recent consensus from the literature revealed that the COVID-19 pandemic widens the behavioural intention–action gap among the supply chain stakeholders. This study found a consistent result in the context of the expected–observed compliance behaviour gap, which enforces the existing findings. The study discusses the impact of COVID-19 and how the results can help shape public policy that directly affects food supply.

1.6 Thesis Outline

This chapter sets the thesis background in context and states the purpose, the motivation, the research questions, and the objectives of this study. Chapter two provides a detailed literature review. It explores the functional perspectives of contracts and critically reviews the benefits of contract farming, factors influencing contract participation, compliance, and expected–observed compliance gap. Chapter three explains the study's conceptual framework. Chapter four discusses the study area, the methodological approaches, the data

collection, the instruments of data collection, and the analytical tools used. Chapter five provides a qualitative insight into contracts and identifies factors that drive farmers' contract compliance choices. Chapter six uses a binary logistic regression model to examine the effect of socioeconomic, transactional, and contract attributes on farmers' contract compliance behaviour. Chapter seven uses the ordinal logit model to assess the effect of socioeconomic characteristics, transactional-level, and contract attributes on the expected–observed compliance behaviour gap among farmers. Chapter eight provides a summary, conclusion, and recommendations/policy implication.

2 Literature Review

2.1. Introduction

This chapter reviews the relevant literature on contract farming (CF) arrangements in developing countries. CF assumes different forms and functions and often clearly states the quantity and quality of the commodity the contractor requires, which varies across firms and countries. Thus, section 2.1 discusses the typology of contract, which conceptualizes contract from the functional and the transaction cost economics perspective, which is new institutional economics. According to Wolf *et al.* (2001), one of the critical roles of contract farming plays three critical roles: coordination, performance motivation, and risk sharing. These and other benefits derived by smallholder farmers from contract participation, such as enhanced welfare and improved production efficiency, are discussed in section 2.2.

Despite the benefits and opportunities associated with CF, it comes with many transaction complexities that hinder the participation of many smallholder farmers. These complexities and other factors affecting smallholder participation in a contract are elaborated on in section 2.3. Moreover, CF is not devoid of the breach, which makes contract enforcement inevitable for an efficient transaction. Section 2.4 highlights contract enforcement in developing countries, and section 2.6 provides insight into contract compliance and the incidence of contractual breaches in developing economies.

Furthermore, contract compliance is critical for sustaining ongoing bilateral relationships between economic agents, particularly where the use of court is costly. Section 2.7 discusses the determinants of contract compliance among smallholder farmers. While section 2.8 concludes the literature review, highlighting some critical areas that receive less research attention, such as contract compliance behaviour and expected-observed compliance gap.

2.2. Contract Farming and its Typology

The term “contract” is often being used in some literature to refer to CF. A contract is a broad concept that serves both law and economics (Ajwang, 2020). From the law perspective, a contract is an undertaking rectifiable by law or whose fulfilment is recognized to some extent by law as a duty (Macneil, 1978). CF refers to any form of transaction arrangement made

between farmers and agribusiness firms during the preharvest period, which specifies the quality that the farmer shall supply or produce and the price he will receive for the specified quality of the products applied in the agricultural sector (Ton *et al.*, 2018) and (Meemken and Bellemare, 2019). According to Bellemare and Lim (2018), contract farming is a future supply agreement between a farmer and a processor initiated before production starts. Bellemare and Lim's definition is similar to Kumar (2008) and Dhillon and Singh (2006) who defined contract farming as supply and production between farmers and buyers under a forward–looking agreement. This definition is also documented by Poku *et al.* (2018), Ruml *et al.* (2021), Kumar (2008), and Ruml (2020).

As Bellemare and Lim (2018) observed, contract farming cannot be regarded as monolithic, given the variety of forms that the institution assumed. Therefore, it is a broad concept that refers to the various forms of arrangement, provisions, and services, which may form part of the contract agreement, resulting in a diversity of contractual arrangements as observed in the literature. This diversity is due to the variation in the technical requirement associated with the production and transaction costs (Winters *et al.*, 2005) and (Bellemare and Lim, 2018).

2.2.1. Contract Farming: A Functional Perspective

The classic typology of contracting at the farmer–contractor interaction, as highlighted in Jia and Bijman (2013) and Bellemare and Lim (2018), are marketing, production and resource-providing contracts. These contractual arrangements are uniquely distinctive regarding their objective, transfer of decision rights and risk.

a. Marketing contract: under this contract arrangement, farmers and the contractor agree on the conditions of transactions – specifying the product quality, time, and place of sales, which affect farmers' decisions. Under this contract arrangement, the farmer has total control over production decisions. Moreover, the processor minimizes farmers' risks associated with market uncertainty, although farmers bear most production risks.
b. Production contract: under this type of contract arrangement, farmers accept to adopt a particular production method controlled and coordinated by the contractor. Thus, the contractor takes a substantial proportion of the farmer's decision

concerning harvesting, cultivation, and other practices. However, unlike the marketing contract, the contractor bears most of the risks associated with the product marketing.

c. Resource–providing contract. Under this contract arrangement, apart from access to a guaranteed market, the contractor provides farmers with critical production inputs, such as seeds and fertilizer on credit payable in kind. However, the contract terms determine whether decision rights are transferred to the processor or the other way around.

2.2.2. Contract From Transaction Costs Economics Perspective

Williamson (1979) argues in his work, "Transaction Cost Economics: The Governance of Contractual Relation," that beyond just facilitating exchange, a contract's critical role is to minimize transaction costs. According to him, exchange partners will opt for contractual arrangements that minimize transaction costs. Transaction costs are incurred by a buyer and a seller in executing a business transaction (Mugwagwa *et al.*, 2020). It represents all costs that a firm incurs other than the cost incurred from physical production to increase the information availability and reduce uncertainty (Buitelaar, 2004) and (Karaan, 2002).

Transaction costs are categorized into ex-ante and ex-post (Cai and Ma, 2015; Williamson, 1985). The ex-ante transaction costs are those incurred in drawing up a contract, such as search costs, screening costs and bargaining and negotiation costs. The ex-post transaction costs stand for enforcement, monitoring, and transfer costs (Jaffee and Morton, 1994). However, Alene *et al.*(2008), Key *et al.*(2000), and Mugwagwa *et al.*(2020) grouped transaction costs into fixed and proportionate transaction costs. The fixed transaction costs are costs that do not vary with the volume of output, for instance, search costs, negotiation, screening costs, monitoring costs, and enforcement costs. While proportionate transaction costs vary with the output volume, it includes the cost of transferring the products or input being traded, such as transportation costs and time spent to deliver the products to the market.

Three transactional attributes, asset specificity, uncertainty, and frequency of transactions, determine the nature and the level of transaction costs incurred in a given contractual arrangement (Ajwang, 2020; Williamson, 1991).

a. Asset specificity refers to a specific investment in an asset made by one party to support the ongoing bilateral trade relationship. It can assume numerous forms such as physical, human, temporal and brand capital specificity (Williamson, 1985). This study focuses on the processor's asset specificity, implying that the farmer has invested in processor-specific assets whose alternative use is less valuable.
b. Uncertainty relates to the tendency of the actors to behave opportunistically, or uncertainty associated with the market environment, compels contractors to introduce a safeguard measure to neutralize opportunism, which adds to the transaction costs (Mugwagwa *et al.*, 2020; Williamson, 1993). Environmental uncertainties relate to external environmental factors, such as adverse weather or pest infestations, that can neither be controlled nor influenced, and which affect the quality and quantity of output. Behavioural uncertainty may be due to unpredictability in supply prices which makes the contracting parties behave opportunistically (Poku *et al.*, 2018).
c. The frequency of transactions refers to the degree of repetitiveness of ongoing transactions, which can be single, occasional, or continuous (recurrent) (Ajwang, 2020; Williamson, 1979). Transaction frequency stimulates the growth of trust through long-term economic relationships (Lewicki *et al.*, 2006). Through repeated transactions, opportunism disappears as economic exchange develops cognitive and affective trusts, influencing farmers' rational economic decisions for forward-looking conditions.

To characterize commercial transactions and understand the topology of contractual arrangements based on the varying intensity of transaction costs, Williamson (1979) matches the transactional attributes with contractual laws developed by MacNeil (1978), discussed as follows:

a. Classical contract law: This law supports a market organization where transaction parties are autonomous. The law facilitates exchange by enhancing "*discreteness*" and strengthening "*presentiation*" (Macneil, 1978; Williamson, 1979). "*Presentiation*" refers to a commitment "*to make or render present in place or time; to be perceived or realized at present*". This commitment, therefore, necessitates a clear and explicit contract that captures the parties' rights and obligations and all relevant future contingencies relating

to the supply of goods or services (Zhang and Aramyan, 2009). This law instruments "*discreteness"* and "*presentiation"* in two ways. First, it treats the identity of contracting parties as irrelevant to the transactions; it fits "ideal" market transaction economics. Second, transactions are governed by more formal features, and the informal terms are contestable. Moreover, unlike other contractual laws, this law discourages third-party involvement and places prominence on legal documents and self-liquidating transactions.

b. Neoclassical contract law: This law emerges due to several problems that lead to the breakdown of classical contracts. For instance, not all future contingencies that require adaptations can be expected initially. These state-contingent claims may result in a dispute between the autonomous parties and in a world where people are opportunistic, whose representation to believe is difficult to determine. Therefore, some contracts will never be possible until both parties have confidence in the settlement agreement - this exemplifies Neoclassical contract law. Unlike classical contract law, neoclassical contract law allows flexibility in longer-term economic relations by involving a third party in the contract—the third-party assists in resolving disputes and evaluating performance.
c. Relational contract laws: This emerges due to the rising pressure to sustain ongoing relations due to contracts' increased duration and complexity – and has led to the displacement of classical and neoclassical contract laws. The original agreement is the reference point for effecting adaptations in the neoclassical system. However, a reference point for effecting adaptation in the relationship can develop over time under relational contract law. This law ignores the original agreement or gives it less importance. Therefore, relational contracting is an agreement in principle limiting the contracting parties' relationship, including implicit and explicit arrangements. Relational contract law replaces the discreteness of classical contracts with relation – it treats exchange beyond the norms centred on the exchange and its immediate processes.

Therefore, extrapolating MacNeil's (1978) contractual laws and Williamson's (1979) transactional attributes to form a conceptual framework, varying forms of contract arrangements emerge, outlined below as shown in figure 1:

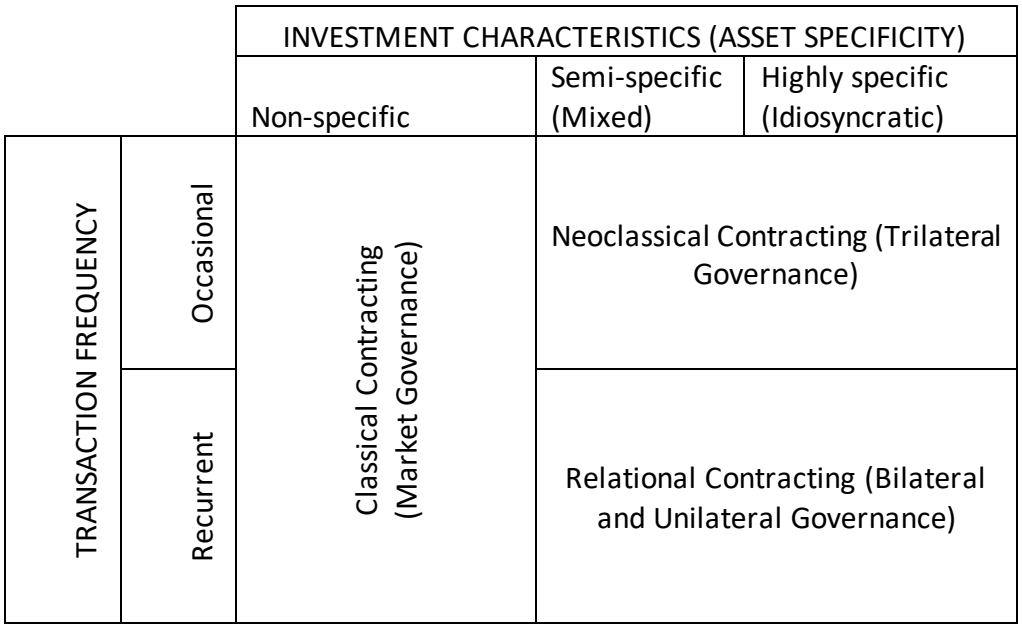
a. Classical contracting: This is referred to as market governance. It is a contract arrangement for a nonspecific transaction that is either occasional or recurrent. When a transaction is nonspecific and recurrent, the autonomous economic agent can use their

experience to decide whether to continue trading or turn elsewhere. Furthermore, when a transaction is nonspecific and happens occasionally, parties cannot rely on experience to safeguard opportunism. However, given that transactions are standardized types, such experience ratings will incentivize positive behaviour among economic agents. In addition, the identity of parties under classical contracting is not essential; litigation is used to enforce laws where relationships are not independently valued.

This contracting system typifies rural spot markets where faceless buyers and sellers meet to exchange a standardized good at equilibrium prices (Williamson, 1979). This type of contract arrangement is common among itinerant traders that do not make any advance commitment to securing good-quality tomatoes. They go around the farmers' farms or rural markets at harvest time to buy tomatoes of a certain standard at a higher price, as documented in Adepetu (2012) and Robinson *et al.*(2010).

b. Neoclassical contracting: This is referred to as trilateral governance. This type of contract arrangement deals with mixed and highly idiosyncratic transactions that occasionally occur based on a written agreement. Once the principal economic agent commits to the contract, the incentive to complete the contract is high, in preference to litigation that could break down the relationship. Thus, an intermediate institutional form is used to enforce the contract rather than litigation. Third parties help in resolving disputes and assessing performance. This arrangement bridges the gap created by bad market governance and the considerable cost of specific transaction (bilateral) governance.
c. Relational contracting: This is referred to as transaction-specific governance. This type of contract arrangement deals with mixed and highly idiosyncratic transactions that are recurrent. Two contractual arrangements emerge for the intermediate market products under the relational contracting system. These contract arrangements are: bilateral that retain the parties' autonomy; and unified contracting arrangements (vertical integration) that remove the transaction from the market and organize it internally within the firm. However, this study focuses on bilateral contracting that falls under relational contracting. In developing countries, relational contracting particularly bilateral contracting, is the dominant form of contractual arrangement that most manufacturing firms are currently using to enhance their business performance (Fafchamps, 2004). The motivation for this contractual arrangement was born from the firms' desire to preserve long-term relationships and maintain supply sources. He found that most firms establish businesses

with suppliers or enterprises whose identities and locations are traceable. They know that contract breach is high when a business partner generates a fly-by-night concern.



Source: (Williamson, 1979; Zhang and Aramyan, 2009)

Figure 1: Conceptual framework for contract classification.

So far, the study has explored different contractual arrangements. The subsequent section provides insight into the topology of contracts in developing economies.

2.3. Benefits of Contract Participation to Smallholder Farmers

Smallholder farmers in developing countries are constantly facing the problem of market failures, income volatility, and insufficient profits to make beneficial investments (Meemken and Bellemare, 2019). A contract is postulated to be a turning point for smallholder farmers that link them to higher-paid markets, it is also a valuable tool to mitigate the risks and uncertainties associated with their production activities (Ton *et al.*, 2018). This postulation is theoretically sensible and has attracted the attention of various researchers to investigate the extent to which this assertion is realizable. The empirical evidence from the literature on the research that investigated the benefits of contract participation amongst smallholder farmers is discussed in the subsequent subsections.

2.3.1. Impact on Farmers' Income

Kumar (2008) also examined the problem and prospects of contracts and their effect on income and employment in the Tumkur district of Karnataka, India. He found that the income earned by farmers under the contractual arrangement doubled, unlike those under non-contractual arrangements. Similarly, through examining the impact of contract participation on income by comparing contract and non-contract growers of apples and green onions in Shandong Province, China, Miyata *et al.* (2009) found that a contract can improve the farm income of participating farmers.

Bellemare (2010) used a contingent valuation experiment to examine farmers' willingness to participate in a contract. Collecting data from six regions of Madagascar in 2008, he found that contract participation accounts for a 12-18% increase in farmers' income and reduces income volatility by 16%. Similarly, Bellemare and Lim (2018) used cross-sectional data collected from 1,200 households across six regions of Madagascar and found that participation in a contract is associated with increased income, food security improvements, and income variability reductions.

Sahara *et al.* (2015) investigated the determinants of supermarket contract participation and the effect of participation on income amongst small-scale chilli farmers in Indonesia using data collected from a sample of 600 small-scale chilli farmers in West Java. They use a treatment-effect model to determine the effect of supermarket participation on farmers' income by controlling other variables in the model. The results show that participation in the supermarket contract is associated with a significant increase in farmers' income.

Bezabeh *et al.* (2020) examined the impact of contract participation on income among malt barley farmers in the West Arsi zones of the Oromia region, Ethiopia. They used the Propensity score matching technique to analyze the data collected from 384 randomly selected farmers (190 contracts and194 non-contracts). Their findings revealed that contract participation is positively associated with an increase in annual gross income – with contract farmers having an increase in gross income, which is about 28% higher than the gross income of non-contract barley farmers.

However, using a primary survey conducted in the Moga, Tarn Taran and Amritsar districts of Punjab, Kaur and Singla (2018) evaluated the effect of the Indian Government's policy that

aimed to double the farmer's income. They found that, despite the technologies and market access provided to smallholder farmers, doubling their income will remain elusive. This study is closely related to Bellemare's (2018) study on the relationship between contract participation and income from non-farm businesses in Madagascar. Bellemare (2018) found that contract participation is associated with a 79% decrease in income per capita the average household derives from labour markets and a 47% decrease in income per capita from non-farm businesses – implying that contracts improve welfare in multiple ways. However, most of those gains come at the cost of an "agricultural involution" on the part of participating households (trade-off).

The major setback of the afore-reviewed literature is that the results may not be generalizable because of the small geographical coverage. Meemken and Bellemare (2019) conducted an extensive study investigating the effect of contract participation on farmers' welfare across six (6) developing countries. While most studies reported a percentage increase greater than 20%, they found that, on average, the income difference between farmers in a contract and outside the contract was insignificant (less than 10%). Therefore, they argue that the conclusion made by previous studies that contract participation increases farmers' income may be misleading.

2.3.2. Access to Inputs and Services

Contracts can also provide farmers access to inputs, credits, and technical and extension services. It is often difficult for small-scale farmers outside the contract-farming context to gain Access to inputs (Eaton and Shepherd, 2001). In their study, Luo *et al.*(2013) investigate the problem of low contract compliance rates in the Chinese grain market. They found that the contractual arrangements of many agribusiness firms were designed to provide substantial production support, especially inputs such as seed and fertilizer. They further observed that many smallholder farmers could not access the higher-paid markets like a contract without this input provision.

Many smallholder farmers experience difficulties obtaining loans due to the lack of collateral they can issue to credit institutions (Fehr *et al.*, 2009). However, Cai and Ma (2015), in their investigation on the impact of trust and transaction cost on contract enforcement among

Chinese apple farmers, found that most farmers that participated in the contract use it as collateral to secure credit loans from commercial banks.

2.3.3. Partial Insurance Provision

Although the contract comprises risk between the contractor and the contractee, studies suggest that contracts provide insurance for smallholder farmers (Bellemare, 2018). Williamson (1979) argues that one of the essential functions of a contract is transferring risk and reducing uncertainties associated with the transaction. Likewise, Olomola (2010) postulated that contracts improve market coordination and provide insurance against market failures. Moreover, it is observed that most contracts in developing countries use a fixed price that transfers most of the risk to the contracting firm, providing farmers with some insurance (Abebe *et al.*, 2013).

Empirical evidence from one studies of contracts confirmed the theory that contract participation provides insurance to the participating smallholder farmers. Relying on a sample of 1,200 households in Madagascar, Bellemare *et al.* (2021), investigated whether contract participation is associated with lower levels of income variability.. They found that contract participation was associated with a decrease in income variability - supporting the claim that contracts can serve as a partial insurance apparatus in a situation where traditional insurance markets fail.

2.3.4. Performance Improvement (Efficiency)

Mishra *et al.* (2018) investigated the impact of a contract on the technical efficiency of farmers producing a low yielding and a high-yielding crop using farm-level data in Nepal. They compared the productive and technical efficiency of farmers producing these crops under contract and non-contract. Their findings revealed an increase in the average technical efficiency of the farmers; an increase of 87 -94 % in high-yielding and 89% to 97% in low-yielding crops under contract.

Mpeta *et al.* (2018) compared technical efficiency (TE) levels across contract and non-contract small-scale sunflower farmers in the Kongwa district of Tanzania's central agricultural zone. They used the propensity score method of Rosenbaum and Rubin that mitigated observational bias among farmers in each category. They found that contract participation is

positively associated with farmers' increase in technical efficiency ranging from 4.5–7.4%; concluding that a non-contract farm produces 24% less sunflower per acre than contract farmers, on average.

Bidzakin *et al.* (2020), in their pioneer work on contracts in the grain value chain in Ghana, examined the effect of contract participation on the performance of small-scale rice farmers. They used stochastic frontier to analyze farmers' performance using survey data from 350 rice farmers selected through a stratified sampling technique. The results revealed that contract participation is associated with a 21, 23, and 26% increase in farmers' technical, allocative, and economic efficiencies.

Having discussed the benefit of contract participation, the following section focuses on factors that serve as barriers or drivers to smallholder farmer contract participation.

2.4. Determinants of Smallholder Farmer Contract Participation

Despite the benefits of contract farming participation, as highlighted in the previous section, evidence from the literature has shown that most smallholder farmers in developing African countries participated less in contract farming (Kaur and Singla, 2018). Therefore, understanding the factors affecting smallholder farmers' participation, as set out below, remains critical.

2.4.1. Transaction Costs

Transaction costs explain why some producers buy, others sell, and others do not participate in markets (Ajwang, 2020; Williamson, 1985). Asset specificity is at the core of every contractual transaction. Under bilateral contracting, contractual specificity determines the nature, and the level of transaction costs, farmers must incur to participate in the market, which some may not afford. For instance, Escobal and Cavero's (2012) study examined the impact of transaction costs and institutional arrangements on smallholder tomato farmers' participation in the agro-processing market in rural Peru. They found that transaction cost associated with agro-processing has created a polarized agricultural economy linked to social and intellectual capital– Only more endowed farmers could deal with the new complexities arising from new marketing opportunities that contractual arrangement entails. The study

suggests that lowering transaction costs will enhance smallholder farmers' opportunities to access agro-processing markets.

Similarly, Woldie and Nuppenau's (2011) limited study examined the impact of transaction costs on banana farmers' choice between the two major marketing channels based on survey data collected in 2007 from different villages in Southern Ethiopia. They found that banana producers' choice of marketing channel is significantly affected by transaction costs associated with the opportunity costs of searching for information, as well as negotiation costs, monitoring, and enforcement costs.

Alene *et al.* (2008) investigated the effects of transaction costs, relative to price and non-price factors, on marketed surplus and input use among smallholder farmers in Kenya. They used a selectivity model to determine the effects of transaction costs and other factors in promoting input use and generating a marketable surplus. They found that transaction costs – both fixed, and the proportionate incurred by the farmer in accessing the market, negatively impacted market entry. They proposed enhanced institutional innovation (such as production and marketing cooperatives), improved information, and transportation infrastructure as possible ways of reducing market entry barriers arising from transaction costs.

Using data on Mexican corn producers, Key *et al.* (2000) developed a model and estimated the effect of proportionate and fixed transaction costs on the household supply response in a situation where some farmers choose to buy, others sell, and some chose not to participate in markets. The results revealed that proportionate and fixed transaction costs negatively impacted farmers' market participation.

Beyond asset specificity, evidence from the literature has shown that under a classical contracting system, proportionate transaction costs, such as transfer costs, influenced market participation. For example, in their study, Osebeyo and Aye (2014b) examined the impact of transaction costs and other institutional and socioeconomic factors on smallholder tomato farmers' marketing decisions in Makurdi Local Government Area of Benue State, Nigeria. They found that farmers' market participation is significantly influenced by transaction cost variables, notably, access to market information, market distance, and transport cost.

Rujis *et al.* (2004) studied the impact of transport and transaction cost reduction on food markets in Burkina-Faso. Using a partial equilibrium model to analyze the effect of reduced

cost on price formation, they found that the effect of lowering transaction costs on market performance is exaggerated. According to them, the effect is negligible, and improvements to market institutions (reform) is more beneficial than investing substantially in road infrastructure.

Blandon *et al.* (2010) adopted a stated choice-based conjoint model to determine the marketing preferences of small-scale farmers of fresh fruits and vegetables in Honduras using hypothetical contracts. They found that most farmers preferred traditional marketing systems exemplified by characteristics, such as cash and carry, absence of cost of entry, and negotiated price. Moreover, few farmers show a preference for modern markets outlets.

2.4.2. Contract Characteristics

The literature shows that contract provisions such as resource provisions, extension and technical services are essential determinants of contract participation among smallholder farmers in developing countries (Ochieng *et al.*, 2017). Ruml (2020) provided useful insight into different contract characteristics and explored how different contract designs benefit farmers in developing countries, using a case study of Ghana's oil palm sector. He found two types of contracts – marketing and resource-providing contracts where the buyer provides inputs and technical services on credit. He determined the effect of these contract characteristics using a regression model that controls for selection bias. The results show that resource-providing contracts increase farmers' input use and yield while simple marketing contracts do not, implying that farmers are more likely to participate in resource-providing contracts than simple marketing contracts.

2.4.3. Socioeconomic Characteristics

The socioeconomic characteristics of the farmer were observed to influence his participation in the marketing contract. For instance, Osebeyo and Aye (2014b) assessed the effect of institutional arrangements and socioeconomic characteristics on tomato farmer market participation in Makurdi Local Government Area of Benue State, Nigeria. They used a logit model on the primary data collected from 165 tomato farmers. They found that a farmer's socioeconomic characteristics, precisely his education level, significantly affect a farmer's

market participation choice. Moreover, Dlamini-Mazibuko *et al.* (2019) found that farmers' risk attitude and asset ownership influence farmers' decisions to participate in the contract.

Escobal and Cavero (2012) examined the impact of transaction costs and institutional arrangements on smallholder tomato farmers' participation in the agro-processing market in rural Peru. They found that participation in the agro-processing market is more specific to some small groups of more endowed smallholder farmers. Better educated farmers have more income and hold larger land size, and subsequent greater ability to expand their operations. This category of smallholder farmers can deal more with the transaction costs that complex contractual arrangements entail.

Swain *et al.* (2012) investigated the determinants of farmers' participation in contracts. They used a binary logit model to analyze the household data collected from 295 farmers in two districts of Andhra Pradesh, India. The results revealed that most contract farmers come from a well-endowed community with high education levels, large farmlands, easy market accessibility, and better productive resources. They suggested that policies that aim to inform contracts will do better if they devise institutional mechanisms to accommodate farmers excluded by the contract.

Ton *et al.* (2018) investigated how a contract enhances farmers' income through an extensive review of literature on a contract covering 13 developing African countries and 26 empirical instances of contract farming. The results showed that smallholder farmers benefitted from better income, but thin this study at less-endowed farmers are often excluded, representing 61% of the cases studies. It is noted that the contract farmers in this study have more assets or larger land sizes than the average farmers in many other study areas.

Meemken and Bellemare (2019), in their review of the impact of contracts on smallholder farmers' income and labour demand across six African countries, revealed that farmer characteristics and households correlate with contract participation. Furthermore, they found that contract farmers and members of their households are more likely to possess productive resources like land and livestock and use modern farm inputs than non-contract farmers. At the same time, female household heads and female farmers have a lower likelihood of participation in contracts.

Zhang *et al.* (2017) determined the factors influencing farmers' behaviour in selecting vegetable marketing channels in Beijing, China. They use a multinomial logit model on the data collected from 191 farmers from 50 villages in seven main vegetable production districts in Beijing's urban areas. The results show that the male headed household and cooperative is negatively and significantly associated with the farmer's choice of market channels effect, while age is associated positively.

Dhillon and Singh (2006) assessed the problems, challenges, and opportunities in contract farming in Punjab using primary data collected from 70 farmers. They found that contract farming increases farmers' income. However, they concluded that contract participation is higher among more educated farmers with large or average land compared to below-average farmers because high and average farmers can accept risks and engage in the more lucrative marketing business.

Kutawa's (2016) study investigated factors influencing tomato farmers' decision to participate in contracts using data collected from 200 farmers (116 contract and 84 non-contract farmers) across the five Local Government Areas of Kano State, Nigeria. The data was analyzed using a double-hurdle model. He found that major socioeconomic factors influencing the decision of the farmers to participate in a contract are education level and farm size. Furthermore, he concluded that these factors should be given greater attention when designing policies that enhance contract participation.

Vassalos and Li (2016) determined the impact of fresh fruit farmers' characteristics on the farmers' likelihood of adopting marketing contracts using a Bayesian approach. The study's findings revealed that younger farmers with larger land size and more ability to expand production are more likely to adopt marketing contracts due to their ability to accept more risks in the marketing business.

Sahara *et al.* (2015) investigated the determinants of supermarket contract participation and the effect of participation on income amongst small-scale chilli farmers in Indonesia using data collected from a sample of 600 small-scale chilli farmers in West Java. They use a treatment-effect model to determine the effect of supermarket participation on farmers' income. They found that the critical determinants of supermarket participation are

educational attainment, farming experience, distance from the main road, and ownership of storage facilities.

Bezabeh *et al.* (2020) examined the determinants of farmers' participation in malt barley contract farming in the West Arsi zones of the Oromia region, Ethiopia, using probit on the data collected from 384 randomly selected farmers (190 contracts and 194 non-contract). They found that farmers' socioeconomic endowments, precisely, age, livestock, access to credit, distance to market, and cooperative membership, are positively associated with farmers' contract participation decisions.

Similarly, Bidzakin *et al.* (2020) examined the effect of contract participation on the performance of small-scale rice farmers in their pioneer work on contracts in the grain value chain in Ghana. They used endogenous treatment effect regression to determine factors influencing farmers' contract participation using survey data from 350 rice farmers selected through a stratified sampling technique. The results revealed that age, educational status, and household labour availability/resources are the key socioeconomic determinants of farmers' contract participation.

Abate *et al.* (2021) determined factors influencing smallholder wheat farmers' market participation decisions in northern Ethiopia, using the Heckman selection model to analyze data collected from a random sample of 190 farmers. The analysis results revealed that farmers' characteristics, precisely their age, education, experience, off farm income, household size, distance to market, and land size, are significantly associated with participation.

Contrary to the preceding studies, Dubbert (2019), investigated the cashew farmers' decisions to participate in contracts and the impact of participation on farmers' performance using survey data collected from 391 cashew farmers in Ghana. Using a switching regression model with endogenous explanatory variables and endogenous switching to control observable and observable factors bias, he found that small-scale cashew farmers participate more in the contract than farmers with an average or larger land size.

Moreover, social networks are also relevant to smallholder farmer participation in contracts. For example, Geng (2014) examined the factors influencing the Chinese aquatic farmers' decision to participate in marketing channels using survey data obtained in Jiangsu province,

China. Analyzing the data using a structural equation model, the results show that Chinese aquatic farmers' relationship networks can positively impact their participation in modern channels through the mediators of trust, specific assets investments, and membership of cooperatives.

Luh (2020) examines the inclusiveness of smallholder farmers in contract farming opportunities along Taiwan's modern food supply chain. The study relied on the data of 10,000 farmers extracted using stratified sampling from Taiwan's farm household data set. Analyzing the data using a logit model, he found that most of the contracting firms in Taiwan showed a preference for contracting growers with large or medium landholdings. He further postulated that membership in a farmer organization can address a firm's scale preference bias.

Luh's postulation above was confirmed by Au and Culas (Au and Culas, 2021) who examined contract farming opportunities among smallholder cucumber farmers in Quang Province, Vietnam. Using secondary data from a survey conducted among selected contract and non-contract farmers in Binh Trieu commune in Thang Binh district, Quang Nam province, Vietnam, a cost-benefit model was employed to analyse the data. They found that contracting agribusiness firms prioritise offering contract opportunities to farmers with a large holding and a membership of a farmer cooperative association.

2.4.4. Government Intervention

Most previous studies evaluating the contract's impact on the farmer's welfare in developing and lower-income countries provide a positive result. Therefore, it attracted the governments of many developing and lower-income countries to provide massive support and intervention to facilitate the participation of smallholder farmers. For example, the Indian Government aimed to double farmers' income by 2022, enacting a Contract Farming Act in 2018. This law is motivated by the government's perception of contract farming as a trusted conduit to achieve double income; thus, enhancing the livelihood of resource-poor farmers (Kaur and Singla, 2018)

2.5. Contract Compliance and its Measurement

2.5.1 Contract Compliance

Contract compliance refers to the extent to which agents fulfil their contractual obligations (Luo *et al.*, 2013) and (Fitoussi and Gurbaxani, 2012). The events resulting in compliance or otherwise by the parties are subjective to the agreement entered by the contracting parties. This differs with the type of contract. For instance, MacLeod (2007) highlighted events that lead to a breach of obligation based on the contract types. Particularly relevant to this study are the standard sales contract and the bonus contract. In a standard sales contract, when a supplier agrees to supply a commodity of a specified performance at a given fixed price and fails to meet the performance or is not adequate, the supplier has breached the agreement. While in a bonus contract, if the buyer agrees to reward a certain level of performance and he fail to do so, breach of contract occurs.

2.5.2 Measurement of Contract Compliance

Different researchers measured contract compliance differently. For instance, Cai and Ma (2015) evaluate contract performance based on the proportion of the contracted quantity supplied by the farmer to the contracting agribusiness firm using four ordinal scales to capture the farmer's level of contract performance: below 25%, 26-50%, 51-75%, and above 75%. However, the major challenge of Cai and Ma's evaluation of contract performance is that it focuses on quantity and ignores quality, both of which are critical to the contracting firm. However, Tefera *et al.* (2020) address the inadequacies of Cai and Ma's study. They examine the determinant of quality improvement among smallholder farmers engaged in a marketing arrangement along the barley supply chain in Ethiopia. They used three ordered logit scales (low, medium, and high) to measure or grade the performance of the farmers in a contract based on the quality of product supplied. However, the major weakness of the above studies is that they rely on aggregated data or self-reported compliance, which provides room for error in the compliance measurement. Therefore, the thesis focuses on measuring the contract compliance of the farmers contracted by the agribusiness firm using transaction level data. Tomatoes are harvested at least thrice per year, and farmers often decide where to sell their tomatoes before harvesting due to their perishability and non-storability. Thus, a situation where a farmer harvests his tomatoes and supplies to the contracting agribusiness

is treated as compliance. However, the situation is treated as a breach when a farmer breaks the contract and sells outside the contract.

2.6. Determinants of Contract Compliance

The following subsections discuss certain factors that influence smallholder farmers' contract compliance.

2.6.1. Contract Enforcement

Contract enforcement is the degree of disciplinary response, or measures, that a particular economic agent puts in place to react to other agents' violation of a contractual obligation, or measures to neutralize the effects of a contractual breach (Antia and Frazier, 2001). Contract enforcement is also viewed as any action to cure any situation during the transaction (Mooi and Gilliland, 2013). This definition is similar to Gani (2018) who viewed contract enforcement as a measure to neutralize the contractees' likelihood of breaching the contract. However, in an agricultural context, Cai and Ma (2015) consider contract enforcement a transaction phenomenon where the farmer delivers the agreed quantity of the products to the contracted parties.

One of the critical determinants of economic growth is the ability to enter into, and fulfil, a binding agreement (MacLeod, 2007). In their study, Koeppl *et al.* (2014) found that trade is made possible by contract enforcement and more efficient by an aggregate investment of capital that is not to be used for production but for enforcing the contract. Contract enforcement increases the efficiency of agribusiness firms when dealing with suppliers from the non-vertically coordinated market (Lu *et al.*, 2012).

Contract enforcement can be either formal, involving the use of court and other legal protections, or informal (Fafchamps, 2004). However, formal contract enforcement across developing countries is generally hugely costly (MacLeod, 2007). The transactions are small, and the contract is often verbal, making legal action inefficient (Fafchamps and Minten, 2001). Thus, most firms resort to informal enforcement, with legal measures are a secondary instrument. The informal enforcement mechanisms include: incentives such as penalties and bonuses (Luo *et al.*, 2013), (Rosch and Ortega, 2019) plus others such as repeated interactions

(MacLeod, 2007), individual social capital example(Wang *et al.*, 2021), reputation (Fehr *et al.*, 2009) and trust (Cai and Ma, 2015).

2.6.1.1. Penalties and Bonuses

Penalties or bonuses, referred to as incentive instruments, are often used by traders and agribusiness firms to enforce quality standards in a non-resource-providing contract. For instance, the useful study of Cadhilon *et al.* (2006) explored the extent to which incentives enhance quality performance among Vietnamese vegetable farmers using a case of a tomato supply chain coordinated by a trader that supplies tomatoes to a modern market outlet. They found that the incentives placed by traders on high-quality tomatoes attracted high performance among the farmers supplying the traders. Similarly, (Saenger *et al.*, 2013) thoroughly experimented with the effect of incentive instruments (price penalties and bonuses) on farmers' commitment to improving input quality among Vietnamese dairy farmers. They use a price penalty for a low-quality supply and a bonus for a consistent supply of high-quality milk. They found that the use of penalty push farmers into investing more in quality, while bonus payment enhances a consistent supply of high-quality milk.

Moreover, these incentive instruments are equally being used to minimize side-selling in a resource provision contract. For example, the innovative study of Luo *et al.* (2013) Investigated the effect of incentive instruments (penalty and rebate) on low contract compliance rates among Chinese grain farmers contracted by a processing company that provides farmers with high-quality seeds and technical services. They developed a three-party game model which is used to analyze the data collected from 850 farmers. They found that, if the resource-providing company offers farmers a rebate, the contract compliance rate of the farmers will increase significantly to about 41%; thus, positively impacting the social welfare of both the farmers and the processing company. They concluded that the low compliance rate in the Chinese grain market is due to the lack of incentives.

Similarly, Kumar *et al.* (2013), in their key study, determined the factors influencing contractual fulfilment among organic basmati paddy farmers in India. They collected data from 40 agribusiness firms operating in contract farming schemes analyzed using a binary logit model. They found that a bonus clause into a contract is likely to promote contract fulfilment among the contracted farmers.

2.6.1.2. Price Differential (Premium)

Farmers are opportunistic and care about short-term relationships. Whenever the price in other markets is high, they tend to sell to that market at the contracting party's expense (Zhang and Aramyan, 2009). Thus, price premiums can be a vital factor that incentivizes compliance.

Traders often use higher prices to incentivize reneging among farmers contracted by agribusiness. For instance, Robinson *et al.* (2012) found that although tomato farmers engage in a contract with agro-processing industries, once the fresh tomato market price is high, farmers may elect to sell to the fresh tomato market despite it still being profitable to supply agro-processors. Similarly in their examination of the relationship between contractual arrangements and their enforcement among farmers, Kumar *et al.* (2013) found that market price is the only factor motivating farmers to breach a contract during delivery. The agribusiness firms buy from the farmers on the initially agreed fixed price. When the open market price goes above the contract price, it creates unanticipated rent to the agribusiness firms and increases the benefits of contract breach among the contracted farmers.

Luo *et al.* (2013), in their study, examined the problem of low contract compliance rate in Chinese grain markets. They surveyed 850 contract farmers across 20 counties in Sichuan district. Analyzing the data using a three-player game model, they found that over 31% of the contract farmers ignored the contract terms and the penalty imposed on selling their grains to the open market.

(Rosch and Ortega, 2019), investigated the differences in willingness and opportunity to accept contracts between farmers in and out of Kenya's French bean supply market. Evidence from this study found that farmers use price premium as an indicator of buyer reliability. Thus, price premium could imperfectly enforce a contract. This study agrees with the study of Ton *et al.* (*et al.*2018), who found that the most effective contractual arrangements provide a price premium in developing countries, particularly where there is no farmers' organization to broker between the farmer and the contracting agribusiness firm.

Furthermore, Repar *et al.* (2018), in their study, explore the challenges associated with the sustainability of contract arrangements along the paprika supply chain in Malawi. Using focus groups and interviews to collect information from supply-chain stakeholders, they found that

most contracts suffer side-selling and often fail because of the price premium offered by the parallel, which offers farmers a more profitable option to sell outside the contract.

2.6.1.3. Trust and Reputation

Trust is also an important enforcement mechanism in contractual relations. It is a belief held by a transaction partner that their exchange partner is reliable, sincere, stands by his words, and fulfils promised role as an obligations (Geyskens *et al.*, 1998). This definition agrees with Barney and Hansen (1994) that trust is the willingness of two or more individuals to enter into a negotiated agreement with each other to incur obligations and simultaneously acquire rights that have imperfect legal protection. Similarly, Poppo *et al.*(2016) refer to it as "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another."

According to Geyskens *et al.* (1998), trust is instrumental in relationship marketing success, and it contributes to the satisfaction and long-term orientation over and beyond the effects of economic outcomes of the interfirm relationship. This definition agrees with (Lu, 2007), who found that a trusted buyer-seller relationship enhanced farmers' participation in the agro-processing market.

Similarly, Houjeir and Brennan (2017) argued that the mechanism of trust and transaction cost are the vital determinants of contract enforcement as the former reduces the latter. However, these studies fail to provide evidence that explains the extent to which trust influences contract compliance and profits of the exchange partners.

Cai and Ma (2015), in their influential study on contracts, evaluate the impact of trust and transaction costs on farmers' contract enforcement choices using cross-sectional data collected from apple farmers in China. They found that farmers' cognitive trust positively and significantly impacts contract enforcement choices.

Reputation is a function only of information about past performance used by some market participants as an asset during the exchange (Fafchamps, 2004). According to Fehr *et al.*, (Fehr et al., 2009), in markets characterised by moral hazard, reputational incentives increase exchange benefits among agents, reduce rents, and render markets more responsive to supply and demand shocks. Repeated interaction contributes to satisfaction and long-term

orientation over and beyond the effects of economic outcomes of the interfirm relationship (Geyskens *et al.*, 1998).

MacLeod (2007), in his study on contracts, argues that informal contract enforcement that relies on a loss of reputation and future market access is a more reliable enforcement mechanism than a bonus and incentive instrument. He adds that a contract offering bonuses and penalties could only be optimal when contracts are enforced through a legal system.

2.6.2. Contractual Provisions

A contract may be categorized into two based on the firm's level of engagement in the production processes. A contract can be either resource or non-resource providing (Cai and Ma, 2015). According to Zhang and Aramyan (2009), a non-resource-providing contract is a marketing contract, whereas a resource-providing contract refers to contract farming that provides farmers with inputs and technical services which would otherwise be unavailable to farmers (Cai and Ma, 2015).

Resource provision was found to be an important driver of farmers' high commitment towards contractual fulfilments. For example, Kumar *et al.*(2013) examine the relationship between contractual arrangements and their enforcement among paddy farmers. They found that resource provisions in contract design are likely to promote contractual fulfilment. Thus, contract performance (compliance) is expected to be higher where the contracting agribusiness provides farmers with some support.

Ruml and Qaim (2020), in their study, investigate the impact of marketing and resource-providing contract in the palm oil sector in Ghana. They used a regression model to determine the extent to which contract type incentivizes specialization and high performance among the contracted farmers. They found that resource provision is positively associated with farmers' high productivity. In comparison, the marketing contract is insignificant.

Ruml *et al.* (2021) used cross-sectional survey data and regression results to examine the association between contract farming and income in the Ghana palm oil sector. The study found that although farmers with both marketing and resource-providing contracts have a significantly higher income, farmers under resource-providing contract arrangements have a notably even higher income difference. Thus, implying that farmers under resource-providing

contracts are likely to perform better than those under marketing and resource-providing contracts.

2.6.3. Farmer Socioeconomic Endowment

Fafchamps (2004) investigated contractual practices among African manufacturing firms in Ghana, Kenya and Zimbabwe. He observed that farmer's contract performance is affected by his characteristics relevant to the contracting situation, such as his experience, technology, and integrity. He further observed that farmers' networks and relationships influenced farmer behaviour, as most contract enforcement is organized primarily around relationships.

Guo *et al.* (2007) evaluated contract performance based on the farmers' acceptance, informed by the farmer's perceived incentive to engage in the contract. They used logistic regression to analyse the data collected randomly from 1820 Chinese farmers across 13 provinces and 47 counties. They found that contract acceptability, which determine the farmer's perceived incentive to engage in the contract, is uncorrelated with educational level of the farmer.

To examine the impact of trust and transaction costs using cross-sectional data collected from apple farmers in China, Cai and Ma (2015) evaluated farmers' contract performance based on the proportion of the contracted quantity supplied. The study employed an ordered probit model in a two-stage regression to conduct the empirical analysis. The empirical results show that socioeconomic characteristics, specifically education, significantly and positively correlated with smallholder farmers' contract performance which they referred to as enforcement choices.

Tefera *et al.* (2020) examined the determinant of quality performance under marketing arrangements among smallholder barley farmers in Ethiopia. They collected data from 148 farmers in the selected Lemu Bilbilo districts of Arsi highland randomly. Ordered logistic regression was used to analyse the data. They found that farmer's level of performance or commitment to quality improvement is positively associated with the farmer's level of educational attainment. More educated farmers may interpret market information better to recognize more opportunities.

2.6.4. Transfer Costs

Transfer costs are proportionate transaction costs that vary with the volume of output or input traded. This includes the cost of transferring the products or input being traded, such as transportation costs and time spent to deliver the products to the market (Alene *et al.*, 2008; Key *et al.*, 2000). The transaction costs under consideration in this section is the cost associated with the transfer of product (tomatoes) from one location to another. Economic agents are assumed to be boundedly rational (Williamson, 1985); thus, these transaction costs may influence the decision of smallholder farmers during harvest to decide where to sell their harvest. Bounded rationality describes how humans make decisions in a way that differs from perfect economic rationality. They often make a decision that is satisfactory rather than best. This is because human rationality is limited by their mental capacity, time and information available to them (Selten, 1990).

Escobal and Cavero (2012) examined the distributional effect of lowering the transaction costs to allow access to improved market opportunities for small farmers in the Peruvian Highlands. They found that choosing where to transact is affected by proportionate transaction costs (notably transportation cost). Similarly, Cai and Ma (2015) investigated the impact of trust and transaction costs on farmers' contract compliance choices. They found a negative association between distance to delivery place and contract compliance choice. However, they found that proximity to the main road tends to have positive and statistically significant impacts on contract compliance choice.

Osebeyo and Aye (2014) also examined the impact of transaction costs and other institutional and socioeconomic factors on smallholder tomato farmers' marketing decisions. They found that transport cost and market distance correlate with farmers' choice of marketing channel during harvest (Key *et al.*, 2000). In their study Transactions Costs and Agricultural Household Supply Response, they found that transportation costs and time spent delivering the products to the market affect contract compliance.

2.7. Effect of COVID-19 Pandemic on Agricultural Supply Chain

Mikasari *et al.* (2021) investigated the impact of the COVID-19 pandemic on the cassava supply chain and the farmers' adaptation to the pandemic in Pasar Pedati Village, Pondok, Indonesia, between March – April 2021. Besides the secondary data, the study uses in-depth interviews

to collect data from the key informants regarding the agribusiness system and the adaptive strategies during the pandemic, which are descriptively analyzed. The study established that the effect of the pandemic is limited to the marketing and processing subsystem, not the entire agribusiness system, as farmers were forced to sell cassava at a low cost to meet their end needs.

Barman *et al.* (2021) discussed the effect of the COVID-19 lockdown on the food supply chain and agribusinesses. They found that COVID-19 impacted the supply chain from both demand and supply perspectives, and its effect on climate and food changes is well-felt. They further observed that the transmission of the virus through food is considered immaterial. Suggesting that protectionist policy will do better if focussed on the safety of supply chain facilities and employees working along the chain to prevent the price increment.

De Paulo Farias and de Araújo (2020) evaluated the effect of the COVID-19 pandemic on the supply of Ceasars in four different regions of Brazil affected by the pandemic. Ceasas are important food distribution centres in Brazil that have great economic importance in Brazilian agribusiness. They used fruit and vegetable prices collected in the first quarter of 2020 and estimated their variance. The study found that the region affected by the COVID-19pandemic experienced food price increments affecting consumers' disposable income. They concluded that establishing policies to facilitate the activities of Ceasars during the pandemic or other related crises is a step toward ensuring food security.

Yang *et al.* (2022) investigated consumer behaviour and food price during China's COVID-19 pandemic. They found that the emergency announcement of lockdown increased food prices by about 8.0 standard deviation. They further revealed that the COVID– 19 effect is meagre but lasts longer, resulting in a panic that pushed people into buying more storable and non-perishable food. Thus, creating tendencies of loss in consumer welfare, particularly among the less privileged households unable to purchase prior to price increases or lack of supply.

Hailu (2020) explored the potential effect of COVID-19 impact on Canadian food processors, opining that the food demand and supply shock caused by the pandemic would likely cause a shortage of raw material supply to food processors. They further argued that the government's measures to minimize disease transmission were unreliable and negatively impacted on the country's economic activities.

Popescu and Popescu (2022) explored the impact of the COVID-19 pandemic on the Romanian agricultural sector. The study used an online questionnaire to collect data from 148 self-selected farmers. The study revealed that the COVID19 pandemic harmed agricultural labour, cost, and farm management. The results indicated that agricultural work was expected to decrease by 35.1%, and costs were expected to increase by 45.9%. They suggested that the pandemic made the agricultural supply chain vulnerable. They further suggested that digitization (adopting digital technology) of the agricultural system is critical for security during crises like the COVID-19 pandemic.

Ridley and Devadoss (2021) examined the effect of COVID-19 on fruit and vegetable production in the United States econometrically. They found that COVID-19 severely threatened the food production of labour-intensive crops. The results further revealed that the losses of $16 million could be attributed to COVID-19 in the lettuce sector, $5 million in apples, and $4 million in grapes.

Martinez *et al.* (2021) explored the effects of the COVID-19 pandemic on the demand and supply of cattle and beef in the United States. They found that the shutdown of food retail points, services, and restaurants slowed the demand for beef. At the same time, the gradual closure of meat processing points resulted in the jamming of live cattle in the supply chain, which led to a low price of cattle and poor flow of cattle supply along the supply chain.

Chen and Yang (2021) examined the impact of the COVID-19 pandemic based on the financial statements of agricultural listed companies in china from 2015 to 2020. They used a transalong revenue function to analyse the data. The results revealed that the COVID-19 pandemic massively shrinks the sales of agricultural by-products – it shortens the sales of by-products of giant agricultural firms to a size lower than that of small and medium agricultural firms suggesting that while government policies shall focus on temporary subsidy provisions and financial support, agribusinesses shall adopt digital marketing strategies.

Xie *et al.* (2021) explored the determinants of farmers' confidence in agricultural production recovery at the early stages of the COVID-19 pandemic in China. The study relied on the cross-sectional survey data collected from 458 farms across the seven provinces in China from February – March. The data are analyzed using the ordered logit model. The results revealed that while social supports correlate positively with farmers' confidence in agricultural

production recovery, their risk expectations are associated negatively with farmers' confidence in agricultural production recovery during the pandemic. They suggest that relief funds and support from the government will facilitate agricultural developments in the COVID-19 post period.

2.7.1. COVID-19 Effect on Contract Compliance

Economic activities of small and medium businesses face serious challenges due to the COVID-19 pandemic, which kept people at home, forcing many businesses globally to integrate information and communication technologies (ICT) to manage transactions (Alecia and Layman, 2021). This strategy may seem infeasible to farmers working in the fruits and vegetable sectors of developing countries, implying a consequence on the behaviour of farmers toward contract compliance. Moreover, literature has shown that where intent and action coexist; action will cease to occur without the intention to perform (Krueger, 1993; Moghavvemi et al., 2015). The intention is often assumed to be a proximal indicator of behaviour (Frank and Brock, 2018). Furthermore, the literature concludes that people hardly actualize what they intend to do (Sheeran and Webb, 2016a). For example, Qi *et al.* (2020b) explore the determinants of green food purchasing behaviour, including during the COVID-19 pandemic. They used a qualitative approach to investigate the extent to which the pandemic affected consumers' purchasing intentions. The results revealed that consumers purchasing intentions for green food went up during the crisis.

2.8. Conclusion

This chapter aims to review contract arrangements and factors influencing contract participation and compliance at the level of farmer-processor interaction. The review concludes that the current studies on contracts focus more on exploring barriers to smallholder farmer participation in the contract and benefits of participation to smallholder farmers, with less attention paid to farmers' performance despite the notable incidences of contractual breaches. Thus, it is paramount to understand the drivers of this decision breach and how it affects the contracting agribusinesses. Moreover, most literature on contract compliance focuses on contract performance from the perspective of contract acceptability among farmers rather than compliance. Furthermore, the existing studies rely more on aggregated transaction data or self–reported compliance to measure contract compliance.

Therefore, understanding the factors influencing smallholder farmers' contract compliance using transaction–level data is critical to agribusinesses and policies that aim to enhance contracts.

3 Conceptual Framework

The overarching objective of this study is to enhance contract performance in Nigeria's tomato markets, focusing on contracts at farmer processor–interactions. The study develops a conceptual model depicted in figure 2, below, based on the theoretical and empirical evidence harvested from the literature to achieve this overarching objective. The thesis idea is conceived from the fact that contract participation precedes contract compliance, as compliance only arises where a contract exists – and farmers behaviour towards contract participation and compliance is assumed to be explained by certain factors and theories discussed in the subsequent sections.

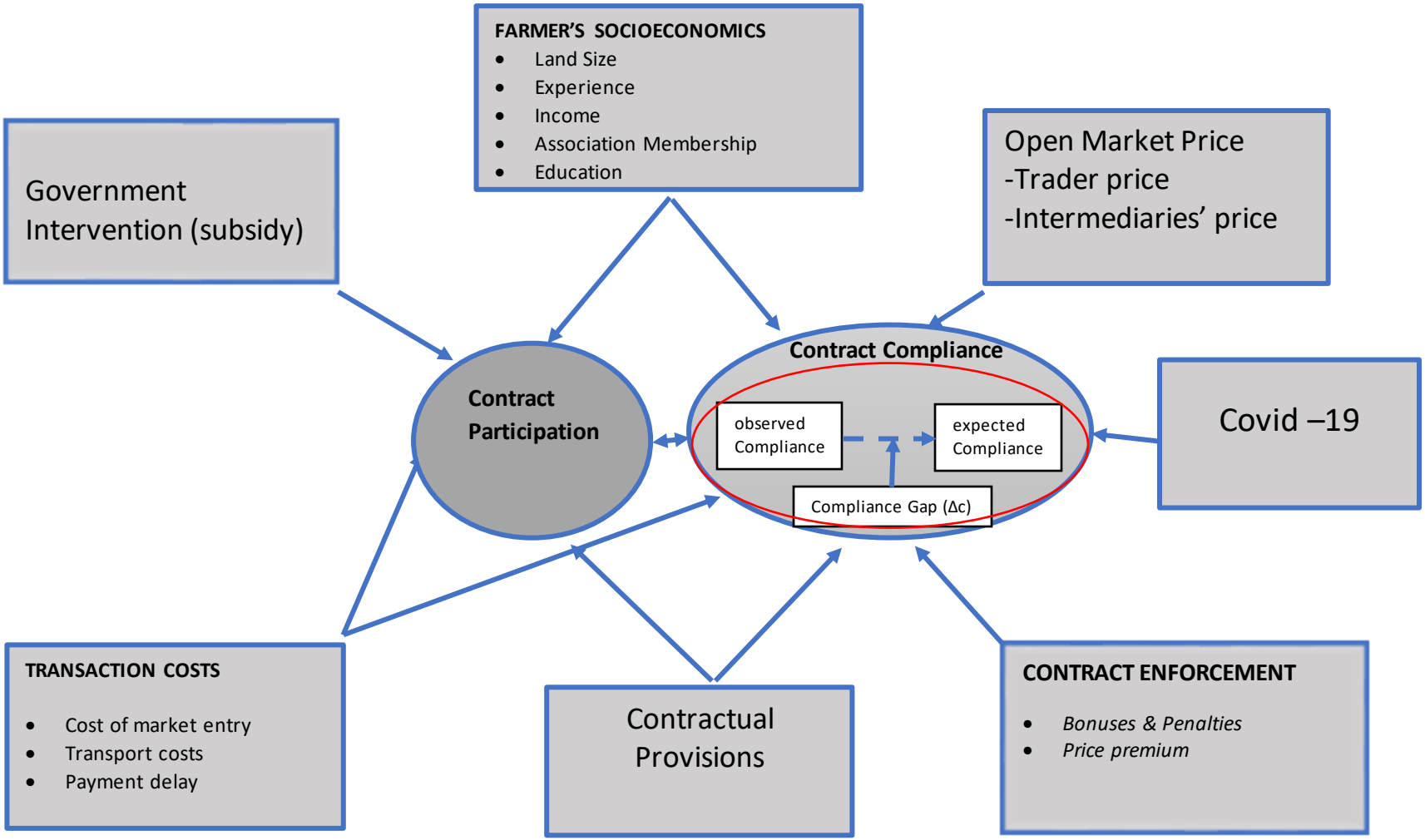


Figure 2: Conceptual Model of Contractual Transaction at Farmer-Processor Interaction

3.1. Definition of Key Concepts

a) Contract and Contract Participation: In the context of this thesis, contract farming is referred to as a contract, a pre-harvest agreement (verbal or written) between tomato farmers and the Dangote tomato processing plant (DTPP), which specifies the quality and the price that a farmer will receive. This definition is documented in multiple studies (Kutawa, 2016), (Ton *et al.*, 2018), (Meemken and Bellemare, 2019), and (Kaur and Singla, 2018). Put differently, a contract is any sales arrangement in which the conditions for exchange are made explicit to both parties before production starts.

b) Contract Compliance: Contract compliance in an agricultural context refers to a farmer supplying the contracting agribusiness firm with the actual contracted quantity of the commodity (Cai and Ma, 2015). It may also refer to the degree to which a farmer adhered to the terms of the contract (Guo *et al.*, 2007). Contract compliance in the context of this study refers to the former definition. Therefore, when a farmer sells outside the contract, that would be regarded as a breach. Moreover, because tomatoes are harvested more than once per annum, the study captures contract compliance at the transaction level using a nominal scale each time a farmer makes a sale. A value 1 is assigned to a farmer each time he makes sales to the company, and a value zero each time a farmer makes a sale outside the contract. Furthermore, the study assumed that the contracting firm (DTPP) fulfilled its contractual obligations.

c) Compliance Differential (expected–observed compliance behaviour gap): The difference between what farmers are expected to do and what they were observed doing is the so-called compliance differential (expected–observed gap(ΔC)) (Sheeran and Webb, 2016a). Ordered responses during the household survey were used to capture farmers' expected compliance. The ordered responses are 1= zero compliance, 2= partial compliance, and 3= full compliance. While the observed compliance is derived by dividing the total number of sales a farmer made to the agro-processor by the total number of harvests a farmer made in a season. A value of 1 is assigned to farmers with average compliance of zero, a value of 2, which is partial compliance for farmers whose average compliance is greater than zero but less than 1, and a value of 3 is assigned to farmers who have an average compliance of 1 (100%). The compliance differential is computed using the difference between expected and

observed compliance. Farmers with a negative compliance differential value are assigned a value of 1, representing the over-compliance category. Farmers with a score of zero are assigned a value of 2, representing a moderate or zero compliance differential category, and those with a positive value are assigned a value of 3, representing an under-compliance category.

d) Transaction cost: Transaction costs are a cost incurred by a firm other than the cost incurred from physical production, which results from running an economic system (Karaan, 2002) and (Buitelaar, 2004). These costs can either be ex-ante (which include costs incurred in drawing up a contract, such as search costs, screening costs and bargaining and negotiation costs) or ex-post (such as enforcement costs, monitoring costs, and transfer costs) (Cai and Ma, 2015; Williamson, 1985).

3.2. Proposed Models (Chapters Conceptualization)

Three empirical models; contract participation, contract compliance, and expected-observed compliance behaviour gap models were drawn from study's conceptual framework above. Each of this model the theories that inform them are outlined in the following subsections.

3.2.1. Contract Participation Model

Contract participation and its determinants was qualitatively studied. The transaction costs theory guides the qualitative exploration of determinants of contract participation. According to Williamson (1979), transaction cost economic (TCE) a rational economic agents will maximize their utility by opting for a contractual arrangement associated with low transaction costs. These costs are appreciated as firms engage in a more organized and highly specified transaction (Ajwang, 2020). Moreover, as observed by Escobal and Cavero (2015) contractual transactions are often complex and, only farmers that are more educated, wealthy and have large land size can participate can deal with the complexities that contract participation entails. In addition, some contract attracted farmers because of the resources provisions as observed in Kumar *et al.* (2013). Therefore, in this chapter, the study assumes that a farmer's decision to participate in the agro–industrial market is explained by transaction costs, socioeconomic characteristics and contract characteristics.

3.2.2. Contract Compliance Model

This model was proposed to investigate the determinant of farmers' contract compliance behaviour. Random Utility Theory (RUT) is the conceptual foundation of this compliance model, as the study posits that a farmer's contract compliance behaviour is explained by combination of factors that maximize his utility. These factors include; socioeconomic characteristics, transactional attributes, and contract characteristics.

The Random Utility Theory (RUT) is based on the hypothesis that every economic agent (decision-maker) is a rational decision-maker, and when faced with alternative choices, he/she or she will choose the alternative that best maximizes his utility (de Luca, 2012). The following assumptions constitute the theory.

a. The economic agent considers m mutually exclusive alternatives which make up his/her choice set I;
b. The economic agent assigns a perceived utility "U_j" to each alternative j from his choice set I and select the alternative that maximizes his utility;
c. The utility assigned to each choice alternative depends on the characteristics of the alternative and that of the economic agent. This statement is represented by the equation below;

   $$U_j = U(\boldsymbol{X_i}) \quad (1)$$

d. The analyst is certainly unaware of the utility assigned by the economic agent to the chosen alternative j, and it must be represented by a random variable.

Based on the above assumptions, it could be said that the probability of choosing alternative j conditional on his/her choice set I, is the probability that the perceived utility of alternative j is greater than that of all other alternatives k;

$$p[j/I] = Pr[U_j > U_k \; \forall k \neq j, \; k \in I] \quad (2)$$

Therefore, farmer's utility function is equation (3) below;

$$U_i^* = \alpha + \boldsymbol{\beta_i X_i} + u_i \quad (3)$$

Whereas, U_i^* is the latent utility variable that drives a rational farmer to either comply with the contract and supply the DTPP $(U^* = 1)$ or break the contract and sell to a trader ($U^* =$

0), $\boldsymbol{X_i}$ is a vector representing factors influencing farmers contract compliance behaviour (socioeconomic characteristics, transaction costs and other variables such as, contract provision, open market price among others) and u_i is the error term. α is the intercept and $\boldsymbol{\beta_i}$is the vector of parameters to be estimated. The hypothetical relationships between contract compliance behaviour and the independent variables and the analytical tools used to test the relationship are discussed in the methodology chapter.

3.2.3. Expected–Observed Compliance Gap Model

Literature have shown that various theories, like; reasoned action, planned behaviour and attitude-behaviour theory, focused on intention, which is believed to be an immediate proximal cause of the behaviour (Shin et al., 2022). These theories assumed that people do what they intend to do. However, the theory of planned behaviour, the most widely used theory in the study of intention and behaviour acknowledged that some intentions do not lead to action, as some are frequently discarded or modified to respond to a situation (Sheeran and Webb, 2016b). Therefore, the study posits that farmers' expected-observed compliance gap is influenced by a change in factors that may affect his utility such as, transaction costs, resource–provision, bonuses, the Anchor Borrower Program, and COVID-19 pandemic. The utility function defining farmers' choice of compliance differential category is summarized in equation (4) below;

$$U_i^* = \alpha + \boldsymbol{\beta_i}\boldsymbol{X_i} + u_i \qquad (4)$$

Whereas Y_i^* is the latent utility variable that drives a rational farmer to over-comply ($U^* = 1$), actualize expectations ($U^* = 2$), or under-comply ($U^* = 3$). $\boldsymbol{X_i}$ is a vector representing factors influencing farmers expected-observed compliance gap and u_i is the error term. α is the intercept and $\boldsymbol{\beta_i}$is the vector of parameters to be estimated. The hypothetical relationships between contract compliance behaviour and the independent variables and the analytical tools used to test the relationship are discussed in the methodology chapter.

4 Research Methodology

4.1 Introduction

The study uses mixed methods, and the analysis is based on a case study conducted in four local government areas of Kano State (Kura, Garun Mallam, Bunkure and Rano), which are the major catchment areas of Dangote Tomato Processing Company. The qualitative techniques, specifically focus group discussions and in-depth interviews were first conducted with the key market stakeholders (farmers, processors, and traders). The qualitative information and that harvested from the literature inform the development of the survey questionnaire used to collect data from the sampled respondents, which is conducted in two phases. First is the collection of household head characteristics, and second, the follow-up survey collects the transaction level information each time a farmer makes sales throughout the dry season. The data collected from the survey were analysed using the econometric models, specifically, binary and ordered logistic models. Figure 3 below summarizes the methodological approaches that the study uses.

Section 4.2 describes the study area. The description includes the location, settlements, demography, climates, economic activities, and the major agricultural commodities market of the study area. The selection of the case study is justified in Section 4.3. Section 4.4 explains the ethical clearance procedure. Section 4.5 discusses the qualitative methods (focus groups and interviews) used to answer research question one: "How do tomato farmers choose between processors' and traders' contracts?". The section covers the participants' recruitment and the data analysis method. Section 4.6 describes the quantitative methods used to answer research question two, which is "what are the factors that drive farmers' contract compliance behaviour?" and research question three, which is "what are the factors that widen farmers' compliance differential (expected–observed compliance behaviour gap)?". The section talks about data collection, questionnaire design, sampling procedure, the models used to analyze the data and their hypotheses, and the measurement of variables.

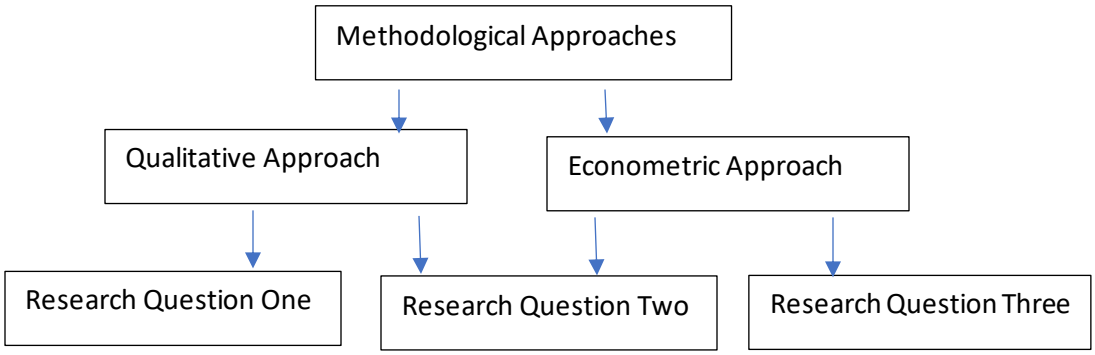


Figure 3: Summarized Methodological Approaches

4.2 Study Area

4.2.1 Location and Settlements of Kano State

Kano State is one of the 19 Northern states of Nigeria. It is located between Latitude 11^0 03"N and 12^0 03"N of the Equator and Longitude 8 ^{0} 35"E and 9^0 20"E of the Greenwich Meridian. Thus, a part of the Sudano-Sahelian zone of Nigeria. Furthermore, the Kano region is settled at 481 meters (about 1500 feet) above sea level, covering an estimated area of over 20,000 square kilometres (km^2) – which is about 8,000 square miles (mi^2). The portion of the land area covered by agriculture is about 1,800,000 hectares, and over 92,000 hectares of land are occupied by vegetation and grazing (Mustapha *et al.*, 2014). Kano State shares its borders with Jigawa State from the northeast, Katsina State from the northwest, Kaduna State from the southwest, and Bauchi State from the southeast, as shown in figure 4 below.

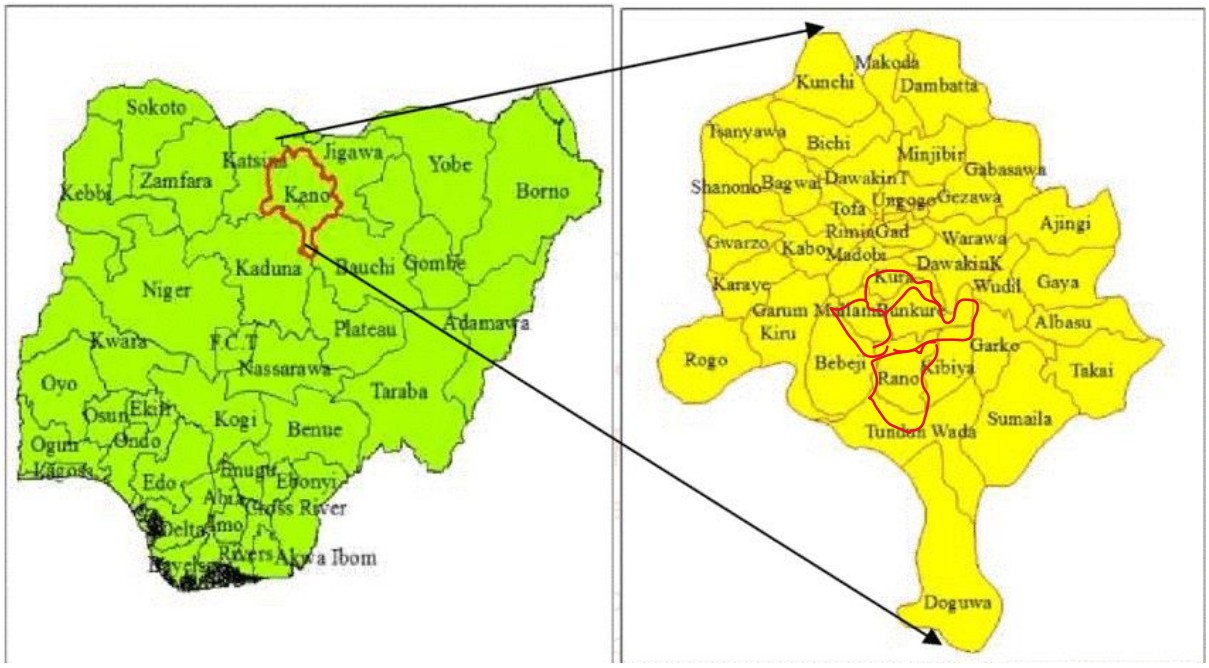


Figure 4: Study Area Map

Kano State has 44 local government areas (LGAs) distributed across two major forms of settlements, the rural and urban (Mustapha *et al.*, 2014; Olofin *et al.*, 2008). Six LGAs constitute the core Kano metropolis Kano Municipal, Kumbotso, Nassarawa, Tarauni, Dala, and Fagge. The other 38 Local Government Areas form the rural areas in the state are Ajingi, Albasu, Bagwai, Bebeji, Bichi, Bunkure, Dawakin Kudu, Dawakin Tofa, Doguwa, Gabasawa, Garko, Garun Mallam, Gaya, Gwale, Gwarzo, Kabo, Karaye, Kibiya, Kiru, Kura, Kunchi, Madobi, Makoda, Minjibir, Rano, Rimin Gado, Rogo, Shanono, Sumaila, Takai, Tofa, Tsanyawa, Tudun Wada, Ungoggo, Warawa and Wudil (Kabuga, 2010).

4.2.2 Demography

Kano is the most populous state in Northern Nigeria (Gambo, 2020). The state's population growth rate was 2.51% in the 1960s, 3.3% in the 1980s, and currently 4.5%, with over 12 million inhabitants (M. Mohammed et al., 2015). Thus, the fastest-growing state in the West African region (Mustapha *et al.*, 2014). The state has an estimated population density of about 856 persons/ km^2 in rural and peri-urban locations and about 8000 persons/km^2 in the metropolis (Olofin *et al.*, 2008). Three significant factors – birth, death, and immigration - determine the population's natural increase (Mustapha *et al.*, 2014).

The population of the state is predominantly rural; however, its characteristics are closely the same across the forty-four (44) LGAs of the state. The gender distribution is about 51% male and 49% female (Gambo, 2020) and (Mustapha *et al.*, 2014). About 47% of the state's population is below 15 years, 48% is between 15 and 59 years, and the remaining (5%) is 60 years and above (Ibrahim, 2014). Furthermore, the population is predominantly Muslim, largely Hausa and Fulani tribes. Other ethnic groups in the state include all the major and minor tribes of Nigeria, such as Yoruba, Igbo, Nupe, Kanuri, Tiv, Ebira, as well as other races from the Middle East, especially Yemen, Lebanon, and Syria, and Asia (Olofin *et al.*, 2008).

4.2.3 Economic Activities

Agriculture constitutes about 80% of the inhabitants' occupations (Lynch *et al.*, 2001). Manufacturing and agricultural commodity marketing comprise the three major economic activities in the state. From an agricultural perspective, Kano state is among the country's major production centres for food and cash crops (Mustapha *et al.*, 2014). Most inhabitants

engage in crop cultivation, animal husbandry, beekeeping, and fishing (Ifeoma and Agwu, 2014). The major crops grown in the state are millet, Guinea corn, groundnuts, okra, soybeans, pumpkins, cowpea, rice, tomato, *etcetera*.

According to Haruna and Murtala (2005), livestock production is another essential economic activity of Kano state's agricultural industry. It is predominantly an intensive system with poultry the most dominant livestock, especially during festivities. Other livestock includes cattle, sheep, and goats. Most people in rural areas practice the integration of crops and livestock rearing with the animals producing the manure that is used to sustain soil nutrients. Kabuga (2010) also observed that fish farming is practised on a small scale in the state by the agricultural department of schools and higher institutions, government parastatals related to agriculture, and a few private individuals. However, fish poaching is widespread in the state's inland waters, such as river Kano and dams such as Watari, Thomas, Tiga, among others. The absence of State legislation has made the fishermen overly dependent on fish poaching to earn their living.

While from the perspective of manufacturing, Kano State is one of Nigeria's most prominent commercial and industrial centres, whose influence extends to neighbouring countries like Benin, Chad, and the Niger Republic (Mustapha *et al.*, 2014). The history of the State's role in trade and Manufacturing can be traced back to the precolonial era. The first manufacturing industry, Bompai Industrial Estate, was established in the 1970s after the oil boom. Between this period to 1982, over 160 industries emerge in the Kano region. Before the late 1980s, there was a rapid growth of modern industry in the state. Over 500 privately owned large, medium, and small-scale industries emerged and were spread across four industrial estates at Sharada, Challawa, Bompai, and Tokarawa. These industries concentrated on producing plastic and plastic products, sweets, confectionary, textile goods, perfumes, leather goods, *etcetera* (Olofin *et al.*, 2008).

New agro-industries recently emerged along Zaria Road – one of the state's major production areas characterized by abundant arable lands and an abundance of irrigation facilities. The major industrial activities in this area include processing arable seeds (vegetable oil production), tomato processing, grains, and rice milling.

In addition, various agricultural commodity markets exist in both the rural and urban areas of Kano state. However, the most notable and prominent markets specializing in large-scale

product marketing are located in the state's urban areas: Dawanau, Yan Kaba, and Yan Lemo markets (Gambo, 2017). Dawanau market is an international market for grain and tubers. It is located in Kumbotso local government area, along Katsina Road, about 20 kilometres from the metropolitan area of Kano State. Yan Lemo is a fruit market located in the Kumbosto local government area, along Zaria Road, some 11km from the city of Kano. This market accommodates all fruits coming to the states from the southern part of the country. Yan Kaba is the largest vegetable market in the state, located in Nassarawa Local Government Area along Hadejia Road. All these markets operate all year round.

Furthermore, in the rural areas, a market like Gafon, located in Garun Mallam local government area of Kano State, along the Abuja – Zaria Road that connects many states, is another prominent vegetable market. However, this market only operates in the dry season. The markets are attended mainly by itinerant traders from urban Kano and other states from the southern part of the country. Moreover, other rural vegetable markets that operate seasonally are Thomas and Bichi markets, which are attended mainly by the local traders supplying the Yan Kaba market.

4.2.4 Farming System

4.2.4.1 Socioeconomics

According to Olofin (2001) in Kano State, one of the core Northern Nigeria, farming, particularly crop production is a male dominated occupation due to cultural and religious reasons, as most of the inhabitants are predominantly Muslims by religion and Hausa Fulani by tribe. The interplay between these two factors restricted female to few farming activities like livestock rearing and fish farming that can be done domestically. An average farmer in the State aged 32 years. Most of the farmers live in simple traditional houses and have received Islamic instructions.

Moreover, on average, over 52 percent of the farmer's annual gross income of USD 9 8152 is earned from agricultural activities, and crop production accounts for 46 percent and livestock keeping adds around 6 percent to the average annual income (Gambo, 2020). Although farming is the primary occupation, a relatively high share of income of 37 percent stems from non-agricultural wages, indicating smallholders diversify their income-generating activities beyond agriculture (Ifeoma and Agwu, 2014)

4.2.4.2 Access to Input and Resources

Farm size was very small, which is about 0.2 ha in the Intra-urban areas and 0.5 ha in sub-urban areas and about 2 ha in the rural areas (Gambo, 2020). A variety of land tenure arrangements for agriculture are common in Kano, which range from individual or family ownership to leasing especially in the rural area.

Agricultural inputs used in Kano state are mostly rudimentary, For example hoes, machetes and sickles are the common implements used, while seeds are sourced from their own stock or purchased from the open market (Adegbola et al., 2012). Majority of the farmers relied household refused and animal droppings and ash for manure – only few farmers have access to improve seeds, fertilizers and pesticides (B. Mohammed et al., 2015).

They lived in farmers in Kano state own at least 0.5 hectares of land on average. These farmers predominantly practice mixed crop-livestock systems, also including fish farming. On average, a farming household in the study area kept about 7 Tropical Livestock Units (TLU) for consumption and income(Adegbola et al., 2012). Cattle are the most important species followed by poultry. According to Kabuga (2010) the average smallholder household consists of more than 6 household members, with an average educational attainment of the household head of 5 years. Among small family farms men usually have the decision-making power as Agriculture is majorly male gender occupation in Kano State.

4.2.4.3 Climate

The climate of Kano State fits with the tropical wet and dry, classified as *Aw/As* based on Koppen's climate classification. The region's climate is the West African savannah type, characterized by a maximum temperature of about 43^{o}C throughout the year (M. Mohammed et al., 2015) and a mean annual rainfall of about 898mm (Ahmad and Haie, 2018). According to (Mustapha *et al.*, 2014), the state has three seasons based on the varying temperature over the calendar months. A cool–dry season lasts from November to February, during which the mean monthly temperature is between 21 and 23^{0}C with a diurnal range of 12 to 14^{0}C. This period is followed by a hot–dry season from March to mid-May. During this period, the mean monthly temperature is more than 30^{0}C, and the daily range is 20^{0}C. A wet–warm season follows with a mean monthly temperature of 39 to 26^{0}C and a diurnal range of about 10^{0}C.

4.2.4.4 Production Patterns

Based on the annual rainfall pattern, the state has two seasons, dry and wet (Mustapha *et al.*, 2014). The wet season lasts from early May to October. The minimum rainfall is often in May, estimated to be 419.6mm, and the maximum rainfall is in August, which is estimated at 1872mm (Ahmad and Haie, 2018). According to Mustapha *et al.* (Mustapha et al., 2014), the rainfall pattern varies across various regions of the state – it is higher in the metropolis (over 1000mm) compared to the southern and extreme northern regions of the state (lower than 800mm). The dry season extends properly from mid-October of one calendar year to mid-May of the following year.

When the temperature regime is merged with the rainfall regime, four tomato production seasons were identified in the state, discussed as follows (Kabuga, 2010) :

Dry and cool season. It is called "*Harmattan*" period or "*Kak*" in the native language. The period lasts from mid-November to the end of February. The season is windy and characterized by low temperatures at night and early morning when the minimum temperature can drop to as low as 10^0C. However, sometimes the afternoon temperature can be as high as 35^0C. The mean temperature within this season is between 21 to 22^0C. This period is the most conducive production time for irrigated vegetable farmers. The temperature around this time allows vegetables to thrive and grow better. Over 60% of vegetable crop farmers, notably tomato farmers, undertake their production this season because tomatoes thrive better under cooler temperatures (Plaisier *et al.*, 2019).

a) A dry and hot season. This season is often called "*Bazara*" in the native language. It is a very short season that follows the *harmattan* period, which lies between the end of *harmmattan* and the onset of rains. Thus, its length in a particular year is determined by the onset of rain. On average, it lasts from March to April and may extend to mid-May. The mean average temperature in this season is 30– 32^0C, with a daily minimum and maximum temperature of about 24^0C to above 40^0C, respectively. A hot windstorm characterizes the season. This season is the hottest period, often avoided by the farmers of perishable commodities, and it has a proven health challenge to residents. Meningitis and Cholera outbreak are more common in this period(Marin et al., 2013).

b) A wet and warm season– This period is called "*Damina*" in the native language. The wet period starts from the onset to offset rains, usually between April or early May to the end of September or mid-October (Olofin, 2008). The monthly average temperature is about 25 to 26^0C, with a daily minimum of about 20^0C. Most of the farming activities take place in this period.

c) A dry and warm season is the shortest, called "*Rani*" in the native language. The interval between the rains cessation and the Onset of the harmattan season determines the length of a particular year. If the rains last till mid-October and the *harmattan* begins in mid-November, it may last just a month or even less. On the other hand, in the Kano metropolitan area, it may last for one and a half months, from October to mid-November. Generally, the onsets and ends of these seasons vary across the southern and northern parts of the state.

4.2.4.5 Cropping System

According to Muhammad *et al*. (2015), two major cropping systems exist in Kano State. First is mixed cropping, the most predominant system often adopted by farmers, especially those who produced arable crops like Maize, Millet, or Sorghum concurrently with other leguminous crops like cowpea and groundnut on the same piece of land. The second type of cropping is mono-cropping, which is a predominant practice among vegetable farmers like Tomatoes. Most Tomato farmers do not produce tomatoes with the other crops. Although few farmers produce more than one crop, it is often done on a different piece of land.

4.2.4.6 ***Access to Irrigation Facilities***

Farmers in the state get massive opportunity to partake in irrigation farming because of the two irrigation projects. The Kano River Irrigation Project is the biggest in the country covering about 62,000 hectares of land, and the Hadejia Valley project that cut across many villages and towns (Mustapha *et al.*, 2014). Over a million people depend on these irrigation facilities for farming activities (Ahmad and Haie, 2018). In addition, Shadoof irrigation called "*Fadama*" in the native language has long been practised by farmers along the flood plains of rivers such as the Watari and Challawa. Shadoof irrigation is also practised in the urban area along the main waterways, notably Jakara River, and mainly for vegetables and fruit production. It is referred to as market gardening or "*lambu*" in the native language.

4.3 Case Study Selection and Justification

The Dangote Tomato Processing Plant (DTPP) was chosen purposively as the case study. The company is the largest and the only functional processing plant in northern Nigeria, having the capacity to process 1200 metric tonnes of tomatoes per day. The DTPP has made available various contract offers for over 10,000 farmers to meet its economies of scale (Shuaibu, 2020). The company is located at Dorawar Sallau, Garun Mallam local government area of Kano State, which is the country's heart of tomato production with proximity to areas covered by the Kano River Irrigation Project (KRIP). The KRIP irrigation facilities give the farmers and the state a comparative advantage in tomato production. Evidence revealed that despite the tomatoes the farmers around the KRIP and other parts of the states produced in abundance, the DTPP could not produce profitably due to a poor supply of raw materials. It could only process less than 300 metric tonnes of tomatoes daily, equivalent to one-fourth of its processing capacity (Jeremiah, 2020). According to this source, the poor supply is attributed to poor farmer participation in the DTPP market and excess breach of contract that is common among the contracted farmers.

Although DTPP has farms, it relies heavily on the contracted supply of raw materials to meet its economy of scale. Its contract has interesting features, the price is fixed, and farmers have access to input and services that would otherwise be unavailable. Farmers contracted by the DTPP can use their contract offer as collateral to receive a production input loan through a commercial bank that has an agreement with the company. When the contracted quantity is supplied to the company, the farmer receives a payment greater than the loan previously taken from the bank. However, many farmers shun the company's contract, and most of those who participated in the contract still sell the contracted tomatoes outside the contract, as documented in Kutawa (2015).

Recently, after attempting many unsuccessful strategies to deal with farmers' poor participation and opportunistic behaviour, DTPP enjoyed Federal Government intervention through the Anchor Borrower Program (ABP) (Shuaibu, 2023). ABP is a program introduced by the government to strengthen the growth of local processing industries and connect farmers to the market (Ugonna *et al.*, 2015). The ABP adopts DTPP as an *anchor*. An anchor is a large-scale processing company supported by the Federal Government on the agreement

that it will contract smallholder farmers accredited by the government through various farmer associations. Under the ABP arrangement, the government provide funding to DTPP to produce a hybrid seedling that meets the processing requirements, which was issued to farmers under the program. Government determines the contract price, which is always above the price in the nearby rural market. However, the story remains the same as most farmers prefer the local market, and those in the agro-processing market assume that the inputs and services given to them by the contracting firm (DTPP) are a free resource from the government, so they find it easier to break the contract.

4.4 Ethical Clearance

Before going to the field to interview research participants, two different ethical clearances were obtained from the School of Agriculture Policy and Development, University of Reading - attached as Appendix I and II to this thesis. The first ethical clearance was requested purposively for the qualitative part of the study. After approval, the study contacted research participants, particularly farmers, traders and processors and began to conduct the fieldwork segment. The second ethical clearance obtained was for the questionnaire survey, which was requested immediately after the first segment of the fieldwork.

4.5 Qualitative Methods

Focus groups and in-depth interviews were used to answer research question one: "How do tomato farmers choose between the processors and traders' contract?" Moreover, a focus group was employed to provide more explanatory depth in answering research question two, which aims to determine the factors driving farmers' contract compliance behaviour. Figure 5 below summarizes the qualitative methods used in this study.

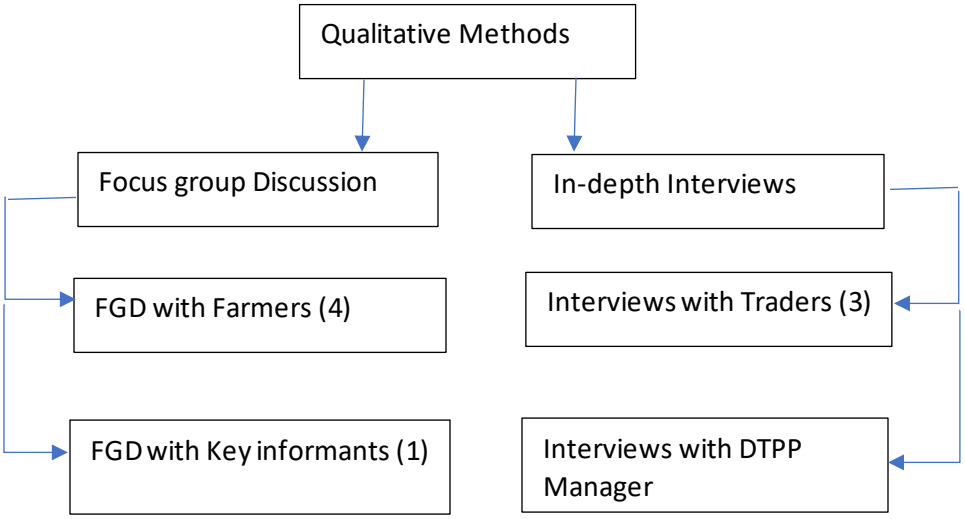


Figure 5: Qualitative Methods

4.5.1 Focus Group Discussion (FGD)

The study used this method to explore farmers' perspectives on contracts and the factors that motivate them to participate in the agro-processor's contracts. The approach is convenient as most farmers live around the same area, and it was easy to bring them together. FGD also allowed the researcher to elicit a wide range of views and behaviour towards a contract and to better understand group dynamics regarding factors driving their production and marketing decisions and factors influencing their contract participation choice.

Four focus group discussions were conducted, one in each of the locations selected for this study: Kura, Garun Mallam, Rano, and Bunkure. A meeting was first held in the study area with the village heads and leadership of farmer associations in various locations, which explained to them the purpose of the research. These stakeholders were the major links between the researcher and the farmers. After contact with the farmers, the study arranged the date, time, and appropriate place for a focus group discussion in every location visited. The focus group protocol was developed to guide the discussion.

A minimum of eight farmers were recruited into each focus group to answer research question one. The recruitment of farmers into each focus group was made to account for heterogeneity, which can help capture various perspectives of the farmers. Thus, each focus group comprises at least one representative of farmer association leadership, one contract farmer, one who previously dealt with agro-processors and withdrew along the way, and one who has not yet participated in a contract. Furthermore, to recruit farmers into the focus

group to understand factors influencing contract compliance behaviour, ten key informants who had participated in a contract, and seemed to be knowledgeable, about the contract were recruited into the focus group.

The focus group discussion for research question one included a set of lead questions covering farmers' key production decisions, market options, factors that influence farmers' contract participation and those that motivated them to comply with the contract. These questions were the same in each location, leading to a subsequent open discussion. The discussion was conducted in the local language and later translated into English during the transcription. Information was collected using audio-recording devices and contemporaneous notes. For research question two, farmers were asked to explain why some variables are observed to be contrary to expectations.

Before starting any focus group, the researcher read the translated version of the participant information sheet to each group of participants. Furthermore, the researcher allows them to ask questions, seek clarification of anything unclear to them, or express any concern about the focus group. Adjustments were made in response to each comment, observation, and suggestion to suit the participants (farmers). For instance, farmers unanimously objected to audio-videoing in each focus group and suggested audio-recording. Thus, data were recorded using an audio device and note-taking.

The focus group discussions in each location lasted about an hour, within which saturation point was reached. At the beginning of each focus group, cold drinks and snacks were given to research participants, and at the end, each participant received one kg of rice as a token "thank you".

4.5.2 In-depth Interview

This method was used to explore the experience and contract perspective of the Manager of the Dangote Tomato Processing Plant (DTPP) in dealing with the contracted farmers, and that of itinerant traders in sourcing tomatoes from farmers in areas covered by the DTPP. The study adopted this method because of the interviewees limited number and the varying nature of their schedules. Furthermore, an in-depth interview is an appropriate method for exploring the experiences of research participants (Braun and Clarke, 2013).

In addition to interviewing the manager of DTPP, four itinerant traders were identified using snowballing techniques because they do not reside in the farming community. The first trader was identified with the help of the leadership of the farmer association, and he linked the researcher with the two others. All the interviews were conducted face-to-face. Each interviewee was contacted and was allowed to decide when and where the interview was to be conducted. An interview protocol was developed to guide the interview, and each interviewee received a copy of the participant information sheet in both English and the translated version prior to the interview. They were asked to make any observation or seek clarification on anything that was not clear. The interview was semi-structured, and the researcher used separate questions that led to subsequent open questions. The interviews last for a minimum of 1 hour 17 minutes, and a maximum of 2 hours and 9 minutes. During each interview, responses were recorded using an audio-recording device and note-taking.

4.5.3 Analysis of Qualitative Data

The study used two analytical processes combining descriptive and thematic approaches to analyse the data collected from the focus group discussions with the farmers and those obtained from the interviews with processors and traders. The descriptive approach was employed in describing the perspective of farmers, traders and DTPP and their decision processes. At the same time, the thematic approach was used to explore the determinants of contract participation amongst farmers. The transcripts were studied and coded line by line. The codes generated are grouped into themes, which were revised many times by the researcher. Some codes were ascribed to various themes already identified from the literature review, and other codes generated were grouped into different themes.

4.6 Quantitative Methods

This method was employed to provide answers to research question two, which is, “what drive contract compliance behaviour at farmer – processor interaction?” And research question three, which is, “What factors influence the expected–observed compliance behaviour gap among farmers contracted by the Processor?”

4.6.1 Survey Questionnaire Design, Data Collection and Computation

The survey questionnaire was developed to collect information from farmers. The questionnaires were initially designed based on the information harvested from the literature. However, it was expanded to include some of the relevant variables identified from the FGDs, specifically, membership of the National Association of Tomato Growers, Processors and Marketers (NATPAM) and a variety of tomatoes grown. The questionnaire is designed in two parts. First is the household-level data that covers farmers' socioeconomic characteristics, transaction costs and related characteristics, and contract design attributes. The second part is the transaction level data which covers the date of sales, to whom the sale is made, quantity sold, the price paid, transport cost incurred, the variety grown, and the type of payment. The data are collected in two distinct phases. During the first contact (between 21/12/2021 – 15/01/2022), household-level data was collected, and then a follow-up survey was conducted during the 2020-2021 dry season of irrigated tomato production to collect transaction-level data each time a farmer made sales throughout the season. This follow-up survey occurred between 23/01/2022 to 04/05/2022. The survey data collection phases are summarized in figure 6 below.

The data was collected with the help of trained enumerators. Eight enumerators were recruited into the survey based on their data collection experience and were trained for three days. During the training, a pilot survey was conducted to allow the researcher and the enumerators to identify problems that may emerge during data collection. Observations were also raised about how to ask farmers some questions that are difficult to translate into their native language. During the first contact, the researcher spearheaded data collection along with the enumerators in each of the locations visited. Two enumerators were assigned to each location for the follow-up survey (transaction level data), and the researcher followed them up to the field at regular intervals to monitor and supervise them.

Moreover, the transaction–level data collected every time a farmer made sales was computed at the household level to capture the actual compliance level of farmers for 2020-2021 dry season production. The computed data was merged with the household-level data.

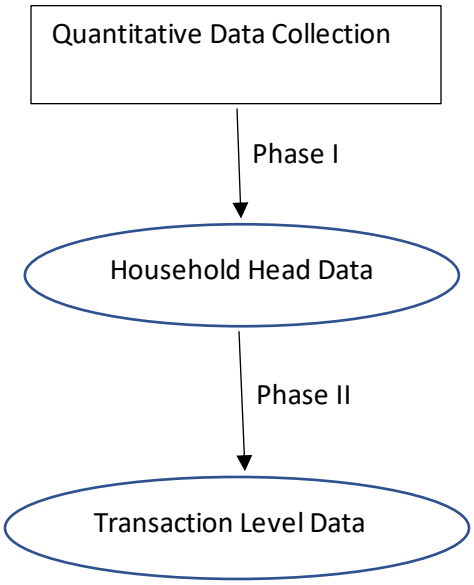


Figure 6: Survey Data Collection Phases

4.6.2 Sampling Procedure

Multi-stage random sampling was applied. In the first stage, the list of farmers that participated in the contract was generated from the production clusters identified in the four LGAs with the help of the Kano State Agricultural and Rural Development Authority (KNARDA) and the leadership of the National Association of Tomato Growers, Processors and Marketers (NATPAM). The list was generated based on participation in the DTPP market and served as a sample frame from which the respondents (farmers) were drawn.

In the second stage, four Local Government Areas (LGAs), namely, Kura, Garun Mallam, Bunkure and Dambatta, were randomly selected from the major catchment areas of the processing company - areas covered by Kano River Irrigation Project (KRIP). Kura and Garun Mallam are near the processing plants and are located along the road that connects major cities, and they are the most accessible areas to itinerant traders. In contrast, Bunkure and Rano are located in a remote area far away from the processing plants and the main road that connect to major cities.

In the third stage, five production clusters were randomly selected from each of the selected LGAs. In the fourth stage, 15 farmers were selected randomly from each cluster to produce a sample size of 300 farmers. Figure 7 below summarizes the sampling procedure that the study used.

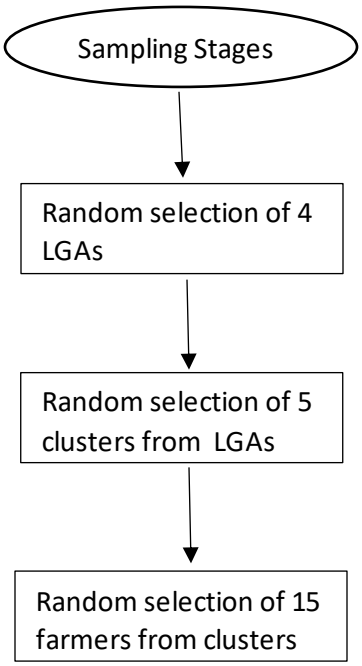


Figure 7: Sampling Procedure

4.6.3 Analytical Models

Two econometric models, binary and ordered logistic models, were used to analyze quantitative data. The binary logistic model was employed to provide answers to research question two, and ordered logistic model was used to provides answers to research question three. Figure 8 below shows the analytical models used in this study and the research questions they attempted to answer.

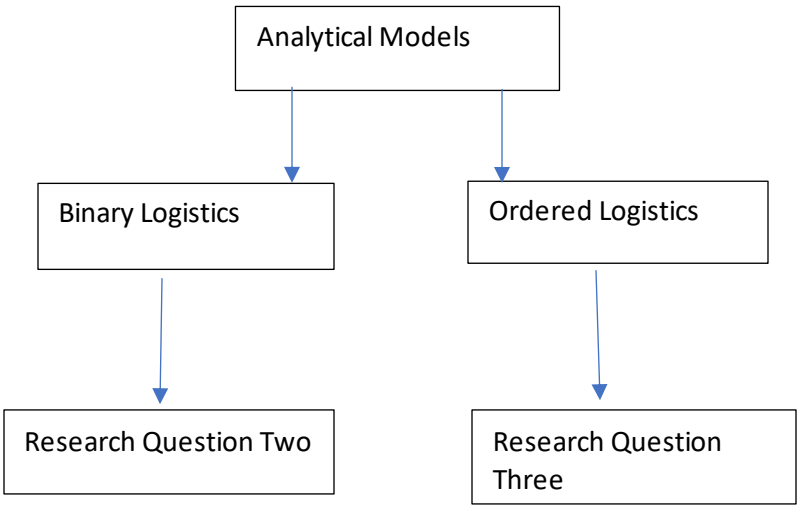


Figure 8: Analytical Tools and RQs

4.8.3.1 Binary Logistic Model

The study uses this model following Guo *et al.* (2007) and Dubbert (2019) to provide answers to research question two, which is "What drives contract compliance behaviour at the farmer–processor interaction?" The model was chosen because of the binary nature of the dependent variable. The Random Utility Theory (RUT) forms the model's conceptual foundation. RUT posits that, if an individual faces a choice between alternatives, he will choose the alternative that best maximizes his utility (Blandon *et al.*, 2010). The model posits that a farmer's contract compliance behaviour is explained by his socioeconomic characteristics, transactional attributes, and contract characteristics. Based on the evidence harvested from the literature, the study developed the hypothetical model depicted in figure 9 below. The hypothetical relationships between contract compliance behaviour (the dependent variable) and the independent variables are discussed below.

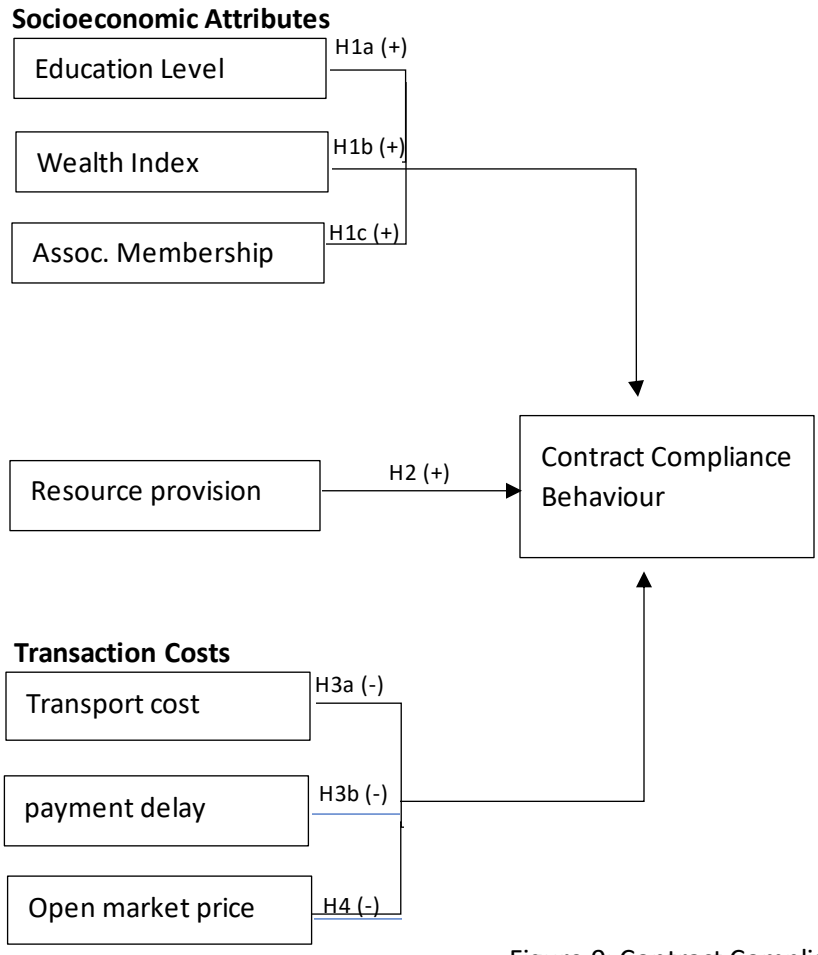


Figure 9: Contract Compliance Model

4.8.3.1.1 Socioeconomic Characteristics vs. Contract Compliance

In Sub-Saharan Africa, a farmer's contract performance is affected by his socioeconomic characteristics relevant to the contracting situation, such as his experience and wealth (Fafchamps, 2004). Cai and Ma (2015) examined the impact of trust and transaction costs on farmers' contract enforcement choices among apple farmers in China and found evidence that farmers' level of education is positively associated with their level of contract performance. Moreover, evidence from numerous studies such as Escobal and Cavero (2012), Ton *et al.* (2018), Meemken and Bellemare (2019), Vassalos and Li (2016) and Kutawa (2016) have shown that wealthy farmers participated more in a contract because of their ability to deal with the complexities that contractual participation entails. Therefore, the study contends that wealthy farmers will have more ability to deal with the ex-post contractual commitments, which will positively impact contract compliance. Nonetheless, farmers who are members of an association or cooperative society may have a reputation that they will want to maintain. The reputation may be regarded as collateral by the farmers, and they will always want to be seen as trustworthy.

Furthermore, it is easier to trace the history of the farmer through the association leadership, which may make them more responsive to the contract terms. Evidence from the literature, such as Oyewale *et al.* (2021) and Dane *et al.* (2021), revealed that COVID-19 affects the growth and performance of businesses due to lockdown measures affecting food exchange and its movement from one location to another. However, there is every possibility that dishonest farmers may use the guise of the COVID-19 pandemic to behave opportunistically, even in the areas not affected by the lockdown. Thus, the following hypotheses are proposed:

H1a:Farmer's level of education will positively influence his contract compliance behaviour

H1b: The higher the farmer's wealth index and the higher his contract compliance behaviour

H1c: Farmers that are members of a farmer association will have higher contract compliance behaviour

H1d: The COVID-19 pandemic will negatively affect farmers' contract compliance behaviour.

4.8.3.1.2 Contract Characteristics vs. Contract Compliance

Some contracts provide smallholder farmers with inputs and technical services otherwise unavailable (Cai and Ma, 2015). The problem of market access often faced by poor smallholder farmers is alleviated by resource-providing contracts (Ruml, 2020). These

resource provisions may influence resource–poor farmers to have positive attitudes towards a contract because they will not want to miss the opportunity (Bidzakin *et al.*, 2020). Evidence from Kumar *et al.* (2008) revealed that resource provisions designed into a contract positively influence farmers' behaviour towards contractual fulfilments. Therefore, it is expected that smallholder farmers will perform better in a contract whose design includes resource provisions to continue benefiting from the resource provisions, as hypothesized below.

H2: There is a positive relationship between resource provision and contract performance.

4.8.3.1.3 Transaction Costs vs. Contract Compliance

There is evidence that farmers are sensitive to extra costs after harvest: they often choose to transact their produce in the market where the transfer cost is low (Woldie and Nuppenau, 2011), (Rujis *et al.*, 2004) and (Alene *et al.*, 2008). Evidence from the study of Cai and Ma (2015), who studied the impact of trust and transaction costs on farmers' contract compliance levels, has shown that distance to delivery place correlates negatively with the contract compliance choice. Based on this evidence, it is sensible to posit that farmers who cover a long distance or incur high transport costs to access delivery place will break a contract in presence of alternative with low transport cost.

Furthermore, one of the characteristics of the contractual arrangement practised in the study area revealed by the qualitative findings was that payment is made within two days after delivery. While traders offer farmers' prices at the farm gate, the transaction is on a cash and carry basis. The instant payment from the parallel market may influence some farmers to break the contract, particularly those that produce on credit or face outstanding service payments. The evidence from the work of Blandon (2010) revealed that most vegetable farmers faced with the risk of perishability indicate a greater preference for a market whose payment is instantaneous. Therefore, based on this evidence, the study hypothesized the following:

H3a: The higher the transport costs that a farmer will incur or the farthest the farmer is from the delivery place, the lower the farmer's contract compliance behaviour.

H3b: The higher the price differential, the lower the contract performance.

4.8.3.1.4 Open Market Price vs. Contract Compliance

Moreover, observation from the literature indicates that farmers are opportunistic and care about short-term relationships: whenever the price in other markets is high, their tendency to sell to that market increases, at the contracting party's expense (Zhang and Aramyan, 2009). Robinson *et al.* (2012) found evidence that tomato farmers engage in a contract with agro-processing industries, however, once the fresh tomato market price is high, farmers break the contract even if they remain profitable supplying agro-processors. Similarly, Kumar *et al.* (2013) found evidence that open market price creates unanticipated rent to the contracting agribusiness firms and increases the benefits of contract breach among the contracted farmers.

H4: Instant payment from the parallel market will lead to low contract compliance behaviour.

The above hypothetical relationships are summarized using a binary model stated below.

$$Y_i^* = \alpha \boldsymbol{X_i} + \beta \boldsymbol{T_i} + \delta C_i + \gamma P_i + e_i \qquad (1)$$

Whereas, Y_i^* is the latent utility variable that drives a rational farmer to either comply with the contract or supply the DTPP ($Y^* = 1$) or break the contract and sell to a trader ($Y^* = 0$), $\boldsymbol{X_i}$ is a vector representing farmer socioeconomic and other characteristics, $\boldsymbol{T_i}$ is the vector of transaction costs , C_i represent contract provision, P_i is the open market price and e_i is the error term. α, β, γ and δ are the parameters to be estimated.

Therefore, the outcome of the farmer's choice is stated below

$$Y_i^* = \begin{cases} Y_i^c, if\ i = 1 \\ Y_i^r, if\ i = 0 \end{cases} \qquad (2)$$

Whereas Y_i^c and Y_i^r are the utility gains by a farmer if he complies or reneges on a contract.

4.8.3.2 Treatment of Endogeneity

In the literature, for example, Robinson and Ngleza (2011) found that the price that a farmer received from the open market is determined by the quality (variety) and the harvest sub-period. According to them, higher quality tomatoes (for example Dangote Variety) attracted higher price from the traders as it is highly preferred by urban consumers. Again, the price of tomatoes is often low during the peak harvest sub-period and likely high in the lean harvest sub-period. Moreover, the anchor borrower program (ABP) facilitates contracts between

some farmers and processors at a fixed contract price, which may affect the price traders will offer those farmers. Thus, it is suspected that quality (variety), harvest sub-periods and ABP could be potential instruments that could affect the efficiency of the estimated parameter.

Furthermore, from the specified compliance model stated as equation (1) above, the model posits that larger quantities sold explain contract compliance behavior, but it also conceivable that farmers in the contracts produce and sell more to comply with the contract, particularly in case of contracts with resource provision. Thus, while quantity sold explains compliance, compliance may also justify high commitment and greater quantities sold, which clearly signalled a simultaneity problem.

To test the endogeneity of the two variables; open market price and quantity supplied, the study used instrumental variable probit model as in Cai and Ma (2015) and Arezzo and Giudici (2017) . The equation (3) and (4) below summarize the relationship between the endogenous variables and the instruments.

$$X1 = b_o + b_1\boldsymbol{Z_{1i}} + v \quad (3)$$

$$X2 = b_o + b_1\boldsymbol{Z_{2i}} + v \quad (4)$$

Whereas, X1 is open market price, X2 is the quantity sold, $\boldsymbol{Z_{1i}}$ is a vector of the instruments of price(variety, Anchor borrower program participation (ABP) and harvest sub-periods) and $\boldsymbol{Z_{2i}}$ is a vector of the instruments of quantity (compliance, Anchor borrower program participation (ABP) and harvest sub-periods).

The instruments are incorporated into equation (1) and test the endogeneity assumptions to determine whether endogeneity is a problem. Thus, equation (1), which is the logistic model without endogneity problem became;

$$Y_i^* = \alpha\boldsymbol{X_i} + \beta\boldsymbol{T_i} + \delta C_i + \gamma P_i + \boldsymbol{\mu v_i} + e_i \quad (5)$$

Whereas, v is the vector of the coefficients of the instrumental variables

4.8.3.3 Ordered Logistic Model

The study uses this model to answer research question three: " What factors influence the expected–observed compliance behaviour gap among farmers contracted by the processor?" The dependent variable (compliance differential) is measured on the ordinal scale of three, which makes using this model appropriate, as in the work of Cai and Ma (2015). The study

posits that farmers' compliance differential is influenced by a change in factors that affect their utility, as depicted in figure 10 below. The model hypotheses, as based on the literature, are discussed below:

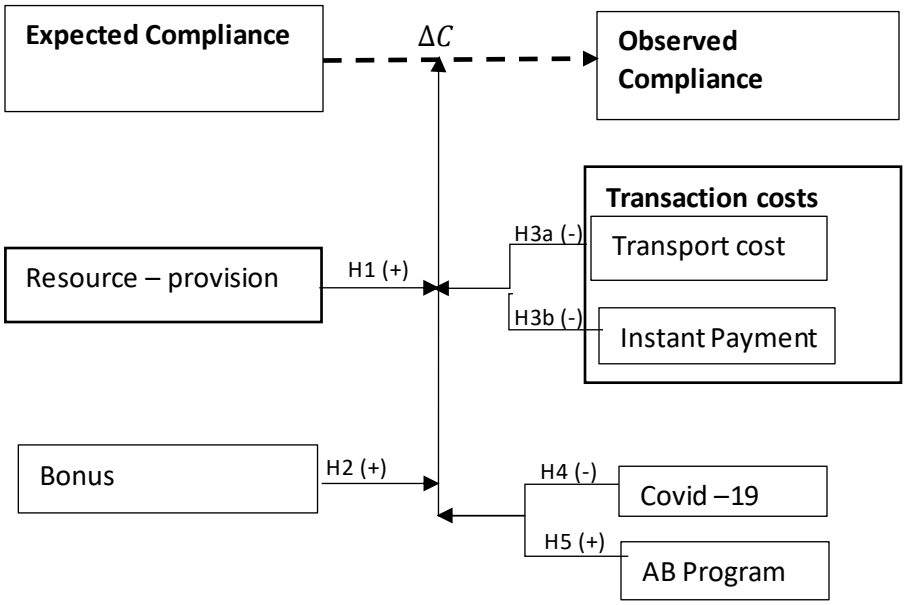


Figure 10: Expected – Observed Compliance Behaviour Model

4.8.4.1.1 Resource Provision vs. Contract Compliance Differential

Evidence has shown that most resource–poor farmers perform well in a contract that provides farmers with resources such as fertilizer and hybrid seeds (Kumar, 2008). The study, therefore, assumed that farmers contracted under a resource–providing contract might perform higher than the expected level of compliance to probe their trustworthiness and provide a justification to receive another contractual opportunity in future. The study, therefore, hypothesized resource provision in a contract will minimize expected–observed behaviour gap among farmers.

H1: Farmers contracted under a resource–providing contract are more likely to comply with the contract higher than they intended to.

4.8.4.1.2 Bonuses vs. Contract Compliance Differential

Luo *et al.* (2013) have shown that bonuses motivate farmers with good behaviour to maintain their positive attitudes towards the contract. Promising bonus to the contracted farmers will encourage them to maintain their expected attitude in the ex-post. The study expects that bonuses will minimize the expected – observed compliance behaviour among the contracted farmers.

H2: Farmers are more likely to comply with the contract at a higher level than they intended when the contract offers a bonus.

4.8.4.1.3 Transaction Costs vs. Contract Compliance Differential

Farmers may change their compliance in a parallel market with a low transfer cost. For example, traders who went around farmers' farms to buy tomatoes may easily persuade contract farmers to change their minds. This change of mind is because farmers incur zero transfer costs and costs associated with loading tomatoes. Evidence from Alene *et al.* (2008) and Saenger *et al.* (2013) have shown that most farmers are sensitive to extra costs after harvest: they choose to transact with market options that minimize their transfer costs. The study contends, therefore, that farmers change their intention to comply with the contract in the presence of an alternative market, particularly those alternatives whose presence minimizes transport costs and any losses they may incur in transporting the tomatoes from the farm to the company.

H3a: The higher the transport cost, the wider the compliance differential.

In most African countries, contract payment is not immediate; farmers often face payment delays. However, farmers have a greater preference for a market whose payment option is at the point of delivery, i.e., cash and carry basis (Blandon *et al.*, 2010). Farmers that produce on credit may change their compliance intention to avert capital tie up and sell to a market where payment is instantaneous (Cai and Ma, 2015). Therefore, it is expected that farmers' level of compliance, especially those that produce on credit, may drop in the presence of a parallel market whose market payment is instantaneous. Therefore, the study hypothesized that:

H3b: The higher the proportion of payments delayed, the wider the compliance differential.

4.8.4.1.4 COVID-19 vs. Compliance Differential

According to Moghavvemi *et al.* (2015), as in Krueger (1993), individuals tend to realize their intention except when disruption occurs. Based on this theory, it is conceivable to assume that the COVID-19 pandemic would affect farmers' intentions. Oyewale *et al.* (2021) and Dane *et al.* (2021) found that COVID-19 has negatively impacted the growth and performance of various small and big agribusinesses. Thus, farmers may be affected by the lockdown, which restricts the movement of vehicles, leaving them with the option of selling to nearby markets, irrespective of their intention to comply. Thus, the study postulates that farmers' expected

level of compliance may decrease due to COVID-19 lockdowns that restrict the movement of vehicles.

H4: Farmers' compliance differential will be wider amongst farmers affected by the COVID-19 pandemic.

4.8.4.1.5 Anchor Borrower Programs (ABP) vs. Compliance Differential

As observed by Kumar (2008) governments can introduce programs to recruit more farmers into the value chain. Most of these programs provide farmers access to input and services otherwise unavailable. The introduction of the Anchor Borrower Program that provides hybrid seedlings, transport cost subsidy and other services to farmers may affect the expected compliance level of those who are part of the program. Under the program, the Government of Nigeria supports farmers through the processing company called Anchor, who are saddled with the responsibility of up-taking tomatoes from farmers at a reasonable price pegged by the government, and under the written agreement with the farmers that they will not side–sell. It is, therefore, expected that farmers that participate in this program will comply more than their expectations to justify why they should continue to enjoy the inputs and service provisions associated with the program participation.

H5: Farmers who participated in the Anchor Borrower Program are likely to have a lower compliance differential.

The above hypothetical relationships are summarized in the ordered model stated as follows,

$$Y_i^* = \alpha \boldsymbol{X}_i + \beta \boldsymbol{T}_i + \delta \boldsymbol{C_i} + e_i \qquad (3)$$

Whereas, Y_i^* is the latent utility variable that drives a rational farmer's decision to change his expected level of compliance in the ex-post., X_i is a vector representing farmer characteristics, including the COVID-19 effect, $\boldsymbol{T}_i$ is the vector of transaction costs, $\boldsymbol{C_i}$ is a vector representing contract characteristics, which include contract price and resource provision. While e_i is the error term. α, β, and δ are the parameters to be estimated. As indicated earlier, the farmer's level of compliance is measured in descending order as follows, (1= under-compliance), (2= zero compliance differential), and (3= over-compliance).

Therefore, the outcome of the farmer's compliance differential is stated below:

$$Y_i^* = \begin{cases} Y_i^L, if\ i = 1 \\ Y_i^M, if\ i = 2 \\ Y_i^H, if\ i = 3 \end{cases} \qquad (4)$$

Whereas Y_i^L , $Y_i^M$and Y_i^H are the utility gains by a farmer if he over – complies, maintain expected compliance or under–complies.

The variables used in this study are characterizes in Table 1 below.

Table 1: Variables, their Scales, and Units of Measurement

	Variable	Unit	Scale
1.	Dependent Variables		
i.	Contract Compliance Choice	1= Comply, 0=Renege	Nominal
ii.	Compliance Differential	1= under-comply, 2=Maintain expectation, 3= Over-comply	Ordinal
2.	Independent Variable		
a.	Socioeconomic Characteristics		
i.	Farmer's Age	Years	Continuous
ii.	Education	1=No/Primary, 2=Junior, 3=Sec., 4=Tertiary	Categorical
iii.	Experience	Years	Continuous
iv.	Land size	Hectares	Continuous
v.	Household size	Persons	Continuous
vi.	Association Membership	1= Yes, 0=No	Nominal
b.	Transaction Level Attributes		
i.	Market Price	Naira	Continuous
ii.	Quantity harvested	kilogram	Continuous
	Transport cost	Naira	Continuous
3.	Harvest Subperiods	1=early,2=mid, 3=late	Ordinal
4.	payment delay	1= Yes 2= No	Nominal

5 Qualitative Insight into Contracts in Nigeria's Tomato Markets

5.1. Introduction

This chapter presents the qualitative findings from focus groups conducted with farmers and interviews with the traders and the manager of the Dangote Tomato Processing Plant (DTPP). It aims to understand contracts and their formation among the market participants (farmers, processors, and traders) and explore the factors that motivate farmers' participation and compliance with agro-processor contracts. Section 5.2 provides an insight into the processor's contract market, features, and evolution over time. Traders' markets, choices of places visited, and the features of the market are explored in Section 5.3. Section 5.4 details farmers' perception of contract and explores factors that drive farmers' contract participation choice. Section 5.5 discusses contracts in Nigeria's tomato markets and the factors driving farmers' decisions to participate in agro-processor contracts based on the interview and focus group results. In section 5.6, the conclusion and policy implications were discussed based on the findings.

5.2. Perspective of the Agro-processing Market (Dangote Tomato Processing Plant)

The interview with the Dangote Tomato Processing Plant (DTPP) manager confirmed that (DTPP) is a large-scale processing company established in 2015. The DTTP is in proximity to most of the areas under the Kano River Irrigation Project (KRIP), the country's heart of tomato production, characterized by an abundance of cultivable land, massive irrigation facilities, and a considerable number of farmers with vast experience in tomato production. These characteristics were assumed to give the company an adequate supply of raw materials.

> *"…you can see that this is one of the largest tomatoes producing area in the whole of the country. And when I say the largest producing area is because of the presence of irrigation infrastructure. They are the largest producer scheme in the whole country. This is what encourage us to establish our factory here and because the farmers in these areas are used to producing tomatoes, they feel as if it is their lives. And we have seen the potential that we will not have problem with supply."*

The interview further revealed that the establishment of DTPP was motivated by the prospect of a tomato processing business, the absence of large functioning processing plants in the country, and government policy that bans the importation of foreign tomato paste and concentrates in an attempt to promote the growth of the local processing industries.

> *"… There is not any single company in the country that is processing tomato. Though there were but they recently become more rebound because of the problem of supply and cheap importation. But we were determined to challenge the status quo, because there is currently a partial ban, tomato concentrate is only allowed into the country on conditions, and the conditions is there is a levy of $1,500 per container and this is meant to discourage importation."*

The DTPP integrated backwards – they have established their farms; however, they rely heavily on farmers' contracted supply of raw materials to meet their economies of scale. Moreover, unlike many other processing companies in the past, the DTTP did not produce finished tomato products; it positioned itself as a large-scale supplier of intermediate tomato products (concentrates) to small packaging companies.

> *"…. we serve as a wholesale of concentrates, you cannot see our product in the market as a tomato paste. The whole idea was to produce concentrates and sell it to small packaging companies; they buy from us, dilute it and do whatever they like with it and sell it to consumers…."*

5.2.1. Features of DTPP Contracts

Ton *et al.* (2018) and Ruml *et al.* (2021) highlighted that different agribusiness firms have unique contract designs. The choice of any contract design is determined by the firm's evaluation of transaction costs and other related factors (Escobal and Cavero, 2012). Similarly, the interview revealed that the DTPP market has the following features:

a. Specific period of production.

Under this contract arrangement, the production decision is solely determined by the DTPP. This is the same for most contracting firms, as observed by (Bellemare and Lim, 2018). The DTPP-specific production period is mainly the dry season because of higher tomato production, and this is where most farmers produce tomatoes because they thrive better under irrigation farming. Thus, DTPP will have an adequate raw materials supply.

"We target the dry season, a period between December to February because tomatoes grow better….and most farmers prefer this period, so virtually every farmer produces in this period…"

The contract starts during the pre-planting period; usually the transition period between the rainy and dry seasons (between October and November). The DTPP invite all interested farmers willing to participate in their contract to start the process of the contractual arrangement. Some farmers are contracted directly by the DTPP, others through ABP where farmer associations broker between the farmers and the DTPP.

b. Fixed price

Some agribusinesses adopted a fixed contract mechanism that took away most of the risk from farmers and transferred them to themselves (Abebe *et al.* (2013). The interview also revealed that the DTPP contract offer is characterized by a fixed price of N40/Kg for farmers that received DTPP's hybrid seedlings, and N30/Kg for independent farmers that do not receive hybrid seedlings from the DTPP.

c. High asset specificity

Asset specificity is a major determinant of transaction costs that often become a barrier to market entry (Palenzuela and Bobillo, 1999) (Ajwang, 2020). The interview data revealed that collateral of N33, 000 per hectare must be incurred by farmers willing to participate in the resource-providing contract. However, other independent farmers contracted by the DTPP do not incur this collateral but must invest reasonably in high-quality tomatoes to meet the DTPP's processing requirement. Most of the independent farmers contracted by the DTPP to supply other varieties of tomatoes (non-DTPP's hybrid variety) are loyal farmers who have been with the company since the beginning. This result is not very different from what is observed by Escobal and Cavero (2012) regarding potato markets in rural Peru, and Alene et al. (2008) also observed the same in the Maize grain markets of Kenya.

d. Agreements/Undertaking

As revealed by the interview, the DTPP normally asked farmers to sign a written agreement through the association leadership. Some of these agreements include terms: there should be no side selling, a farmer is responsible for transporting the tomatoes to the DTPP collection centre, and farmers will receive their payments within 48 hours after delivery. Moreover, they

outsourced tomatoes through verbal agreement with some independent farmers, particularly those consistently dealing with the company over the years. This is a common practice amongst agribusiness firms in developing countries (Fafchamps, 2004)

> *"If a farmer understands and accept our terms and we make it clear to him our expectations and we will waive him cost of hired plastic crates, and provide him with seedlings at a cost, and that we are paying him two days after delivery we then take his name, contact and account details, because from experience some of them will be mounting pressure for payment at the point of delivery"*

e. Contract Enforcement

It is evident from the interview that the DTPP does not take any formal or legal measures to deal with defaulters. It has no record of litigation against farmers. They do not use a court or other legal mechanisms to enforce contracts because it tends to disrupt its relationships with farmers and the entire farming community. This is the same for most developing economies, where most firms resort to informal instrument measures to enforce the contract (MacLeod, 2007).

> *"What! It will be a news headline that the giant business mogul sued a poor farmer for a chicken change."*

However, the DTPP relied on the following informal enforcement options:

a. Credited threat (penalty): To discourage bad behaviour among the contracted farmers, the DTPP credits a threat of terminating the contract of farmers that renege. Most agribusiness firms introduce penalties to increase defaulting costs (Luo *et al.*, 2013). However, the interviewed data revealed that the threat is not credible to some farmers because they do not rely heavily on the DTPP market, and thus, they easily break the contract.

> *"We often threat to delist them if they default but trust me, they will always renege in as much as the opportunity exist."*

b. Bonuses and promises: Some contracts find it pertinent to give loyal farmers a rebate or bonus to reward and encourage good behaviour (Kumar *et al.*, 2013) and (Gani, 2018). To encourage good behaviour among the contracted farmers, DTPP also gives bonuses, promised future contracts, and other business opportunities to persuade farmers to comply with the contract, as highlighted by the interviewee:

"Huh! To be honest we do not do anything because we want them to trust us…. But we always persuade them to comply with the contract, and we promised them bonuses and future contract opportunities if they comply"

5.2.2. Evolution of DTPP's Market

The DTPP production activities witnessed several changes in strategies related to raw material outsourcing. It started by identifying farmers during the pre-planting period with the support of farmer associations. The identified farmers were then offered a contract with an agreed fixed price, specified quality, unwritten code of conduct, and indefinite duration. The contract also provides farmers access to lending institutions to receive production inputs loans to support the farmers in meeting the quality requirement specified by the DTPP.

"We identify some farmers and also identify a lending institution, we brought the farmers to the lending institutions, they lend to them on the agreement that we will uptake from them…."

However, this approach is challenged by farmers' opportunistic and dishonest behaviour. There is an excess breach of agreement – most of the farmers side sell for a higher price, and most fail to supply the agreed quality tomato or repay the loans given to them. Thus, most tomatoes that are supposed to go to the company are in the fresh market.

"… about 70% of the farmers we initially identified defaulted the loan given to them and sell the tomatoes to another buyer outside the contract, they will only be telling you lies and stories that the variety is a low performing variety and the outcome is discouraging despite the fact we have seen some of the tomatoes loaded on truck and transported to the east."

Moreover, the tomato disease outbreak, popularly known as the Tomato *Ebola virus*, also called *Tuta absoluta*, coincides with the period when this contractual arrangement started, forming the basis of excuses for many farmers unaffected by the disease outbreak to renege on the contract. The disease outbreak caused a severe scarcity of tomatoes in the fresh and processing market, which caused an abnormal rise in market prices. Thus, most contracted farmers sold tomatoes to the fresh market to maximize profit.

"One thing about these farmers is that they take any little advantage to break agreement. A lot of them go under the cover of Tuta absoluta to create excuses."

"The problem is the outbreak of Tuta absoluta did not only affect us because even the fresh market is short of supply, in fact the price of a piece of tomato in fresh market is thrice the price of piece of apple which is the most expensive fruit in Nigeria."

In the post-*Tuta absoluta* period, the DTPP learned that the excess breach of contract is not limited to disease outbreaks but fresh market price and quality specification. The fixed price and quality specifications do not work for most farmers. Most farmers unaffected by *Tuta absoluta* break contracts and sell to the fresh market because the price is higher in the fresh market. Most of them prefer growing local tomatoes that are more resilient to local conditions as observed in Ghana by Robinson *el.* (2012).

> "…*They only want to take advantage of the contract to access the inputs and run away. They will never supply the company in as much as the price in the fresh market is higher.*"

Thus, the DTPP resorted to a flexible pricing strategy and accepted all types of tomato varieties grown by the farmers to sort the market price issues that influenced most farmers to renege on a contract and increase the supply of raw material. The DTPP also relaxed the quality requirement; they accepted any tomatoes provided they are red. Under this arrangement, farmers and processors enter into a contract agreement without fixing the price. They monitor the market price for two to three days at harvest time and set the price, which is reviewed every two to three days.

> *"We decided to engage all farmers willing to supply us on a flexible supply contract and take any type of tomatoes that the farmers are growing provided it is neither green nor is rotten. It was also a trial."*

This strategy worked for DTPP in terms of enhancing the quantity supply. However, it was challenged by two issues. First, there are many times when the fresh market price is remarkably high, and the DTPP cannot go above a specific ceiling price else they will run at a loss. Thus, many farmers renege.

> *"You know these farmers, they are dubious sometimes, when price in fresh market is very low, we add say N200, and when a time comes where the fresh market price is very high and the company cannot go above the ceiling price of N200, they will come and start begging you to add the price and we cannot because we are going to end at a loss. Trust me, because of that you will not see their face until when the price in fresh market is disastrous for them."*

Second, the DTPP started having a problem with a low degree of Brix because most farmers prefer growing local varieties like UC 82B and Roma, which have high water and seed content. However, these varieties are more resilient to local conditions and unsuitable for industrial processing.

In the middle of this dilemma, DTPP was approached by the Federal Government to participate as an anchor under the Anchor Borrower Program (ABP). An anchor is a large-scale processor that the government supports to uptake tomatoes from smallholder farmers. The ABP aims to enhance value chain performance by connecting smallholder farmers with an assured market and supporting local agro-industries growth by ensuring the supply of good quality raw materials. Under this arrangement, the government funds DTPP's development of hybrid seeds and the production of seedlings. However, the government set up a guaranteed minimum price of N40/kg.

Consequently, the DTPP offers contracts to farmers with varying conditions. Farmers under ABP only receive hybrid seedlings at N33,000/Ha, payable in kind. However, a farmer must provide collateral of N30,000 and present the local purchase order (LPO) issued to him by the association leaders who serve as his guarantor. Under this arrangement, farmers sign a written agreement that they will not side-sell. Moreover, other farmers not under the ABP must pay the same N33,000/Ha of hybrid seeds to be offered a contract, and with the agreement that they will not side-sell.

> *"You know! At last, we were approached by the Central Bank of Nigeria (CBN) to participate in the ABP as an anchor. So, employ experts to develop our own hybrid variety that meet our requirement and give to our loyal farmers and others that agree to supply us at a cost but those that are under the ABP program must be through a farmer association that will serve as a guarantor and the farmer must give collateral of N30,000…."*

With DTPP's variety and other hybrid varieties, a farmer receives a price fixed at N40/Kg, higher than the maximum price of N30/Kg that a farmer initially receives from the DTPP for supplying any tomato varieties. The N40/Kg is expected to make contract compliance reasonably possible for farmers at times when the price in the fresh market is high.

> *"The quality difference is very clear with the variety we issue farmers, for instance if you use farmer's UC 82B or Roma variety you will have a ratio of 9:1 Kg (DTPP 5:1) for raw tomatoes and concentrates respectively. This is why we pay higher price for our hybrid variety; it is going to be a win-win for us and farmers because even when the fresh price is high some farmers may not be tempted to break*".

Figure 11 Evolution of DTPP's Market

5.3. Perspective of Traders

5.3.1. Participant Demographics

Traders played an important role in connecting farmers with urban consumers, taking the risk of transporting tomatoes over a long distance to make them available in the urban space (Robinson and Ngeleza, 2011). The demographics presented in table 2 below show that 100% of the participants were male, which is contrary to what is found in Ghana where female gender referred to as "market queens" dominate the trading business of tomato(Robinson and Ngeleza, 2011). This gender gap in tomato trading is attributable to the cultural and religious reasons that genderize the type of this business. Moreover, an average a farmer has an average age of about 48 years and trading experience of over 16 years. Out of the four (4) participants, 2 attended secondary school, one attended primary school, and the other attended tertiary school. Furthermore, 75% of the participants are registered members of the National Tomato Traders Association.

Table 2: Participant Demographics (n=36)

Characteristics	No	Percentage
Male	4	100%
Mean Age	47.6	
Mean Experience	16.3	
Education		
Primary	1	25%
Secondary	2	50%
Tertiary	1	25%
No Formal Education	0	0%
Total	4	100%
Trader Association Membership	3	75%

Source: Author's Survey 2022.

5.3.2. Choice of Areas Visited by Traders

The interview revealed that traders have no specific area of preference. They mapped out the places they visit based on the harvest season – as various locations in the country have different seasons, as explained by one of the interviewees:

"Each production area has its own harvest season, depending on the availability of the tomato in the locations, sometimes you buy from Kadawa, sometimes Zaria, sometimes Thomas and sometimes Kazaure bridge. So, the one you got is the one you must use and sometimes Badume. We go to everywhere we know or heard that they produced tomatoes."

In the study area, traders are less active in the early harvest periods yet highly noticeable between January to March when tomato supply in the market is high, as revealed by the interview. The interviewee further disclosed that the varying production calendar across the country allows traders to supply tomatoes to urban spaces all year round.

"You can see that out of the 12 months calendar year we always have a place to go and buy tomatoes from depending on the location."

Furthermore, as revealed by the interview, one of the most reliable areas visited by most traders is "Kadawa", the largest tomato production area that falls within the major catchment areas of Dangote Tomato Processing Company (DTPP). This area is near the main road that connects the major cities and is easily accessible by trucks. Moreover, most of the tomato farmers in this area are contracted mainly by the DTPP. Thus, the tomato produced in this area is a hybrid tomato variety which is big, has low water and seed content, is reddish and can travel for ten days without any change in its morphological feature.

"One of the most reliable areas that constantly supply tomatoes is Kadawa because the area is by the roadside and it come with its good-quality and not far from market, unlike if you are to travel to remote area the change in weather that occur while transporting the tomatoes will cause some many physical deformations. Therefore, most of us prefer tomatoes coming from Kadawa due to the access road, and the tomatoes are bigger than the one obtained from Zaria"

5.3.3. Features of Trader Contracts

Transaction in an open fresh market is typically classical contracting, as pointed out by Zhang and Aramyan(2009). It is often non-recurrent; producers meet with traders that they may never meet again and exchange ownership (Williamson, 1979). Similarly, the interview data revealed that traders were very dynamic. They travelled all over the country searching for tomatoes to buy and transport to the urban markets. The transactions at the farmer–trader interaction, is characterized by the following features:

a. Low asset specificity

There is evidence from the interview that traders buy and sell every type of tomato from farmers irrespective of quality to make it available in the urban space, especially during the lean supply period when there is lower production of tomatoes across the country. This is because of the nationwide strong trader associations that enable them to influence demand and supply in the urban markets.

> *"We buy all types of variety because all that matter to urban consumers is freshness especially when the supply is low in the market"*

However, the interview revealed that traders were very selective, particularly during the peak period of harvest. During this period, they screen and select high-quality tomatoes, which are big in size, firm, turning pink or light red, and can withstand long-distance journeys with few losses whilst attracting higher prices in the urban markets. Although not all farmers have access to traders, the interview revealed that most traders have direct access to farmers and agents in most of the locations where farmers have a good knowledge of traders' quality preferences.

b. Agreement

Most traders hardly agreed with the farmers before the start of production. However, it was found that traders with established long-term relationships with farmers provided them with credit to buy inputs at the beginning of the planting period, which is often repaid in kind. This type of credit agreement often takes away the bargaining power of farmers.

> *"Sometimes they will call you to ask for credit and you can give them to pay for your supply in advance, but the price in the market determines how much tomatoes they will supply you as a repayment, sometimes we are affected by the price while sometimes they are the ones affected."*

c. Pricing Strategy

It was found from the interview that traders were very strategic in pricing. They always keep their price high in the market to secure a large volume of tomatoes to be supplied to the urban markets. This is also observed in other African economies (Robinson and Ngeleza, 2011) and (Gambo, 2017). In the nearby rural assembly markets, noticeably *"Gafon market"* that operates during the dry season cropping period, traders placed their prices higher than the price offered to farmers by the other buyers in the markets. Moreover, when they arrived at

farmers' farms during the harvest period, they offered a price at the farm gate above the price in the nearby rural market and place it the same as or slightly higher than the contract price.

Traders highly prefer the DTPP hybrid variety and often pay farmers a price higher than the contract price. The DTPP variety attracts higher prices in the urban markets because of the higher preference placed on it by consumers due to its aroma, taste and reddish colour when used in soup, as explained by one of the interviewees.

> *"The variety is very firm like an apple and if you put it on this table it can stay for up to a week without showing any physical deformity. So that variety has a far better price, because if we sell the local variety at 5,000/ 20KG we will sell this variety at 10,000 per 20 KG because of its quality."*

It is observed that traders have a long-term relationship with some farmers, sometimes lending them money to buy production inputs. Thus, some farmers contracted by the DTPP may break the contract and sell some proportion of their tomatoes to traders at a slightly lower price or equal to the contract price.

> *"You know that we have a long-term relationship with so many farmers and we buy tomatoes from them all year round, we lend them money. So, even if the company is offering them a better price, they can still supply us at a price that is slightly lower than that of company. For example, if a farmer produced 2000 baskets in all and the company price offer is best deal for farmer, a farmer can supply the company 1, 200 baskets and supply 800 baskets."*

5.4. Farmers' Perspective of Contracts

5.4.1. Characteristics of Focus Group Participants

Forty-four participants were recruited for the focus group conducted in each of the four selected locations: Kura, Rano, Bunkure and Garun Mallam (12 participants per each focus group). However, only 36 farmers attended; each focus group had a range of 8 – 11 participants per group (median 10). The participant demographics presented in table 2 show that 100% of the participants were male, which is due to religious and cultural reasons that make farming generally a business of the men. They have a median age of 31 (range 22 – 65 years), and the median experience in tomato production was reported to be ten years (range 5-30 years). Moreover, most of the participants (92%) attended at least primary school. A median land size cultivated by the farmers were reported to be 2 hectares (range 1-20 hectares)—furthermore, 47% of the participants are registered members of farmer

associations. About 53% of the farmers are not currently in contract, 39% were currently in contract, and 8% of the participants initially accepted the contract and later decided to withdraw.

Table 3: Participant Demographics (n=36)

Characteristics	No	Percentage
Male	36	100%
Median Age (Years)	31	Range (22 –65)
Median Experience	10	Range (5 – 30)
Land Size	2	Range (1 – 20)
Education		
Primary	11	31%
Secondary	15	42%
Tertiary	7	19%
No Formal Education	3	8%
Total	36	100%
Contract Status		
Currently in Contract	14	39%
Not in Contract	19	53%
Participated and later withdraw	3	8%
Total	36	100%
Farmer Association Membership	17	47%

Source: Author's survey 2022.

5.4.2 Farmer Perspective of Contract

From the focus group data, some of the keywords that farmers frequently used to provide an account of their perception of the contract are shown in the word cloud below: "agreement," "price," "supply", and "provisions." Therefore, farmers perceive contracts as supply arrangements agreed upon wittingly between them and the processing company before planting: these specify the quality of tomatoes that the farmers will supply, the price they will receive, and provides farmers with the production inputs. Moreover, most farmers acknowledged that irrespective of the agreement type (verbal or written), fulfilment is regarded as an obligation because of the religious implication of breaking the agreement.

> *"We are all Muslims, and we all know the implication of not fulfilling your words since God is watching you.*"

However, some farmers maintain that contractual arrangement based on a verbal agreement and without any commitment from the company's side, such as the provision of improved seeds, pump machines, etc., is like non-contracting. They have the option to sell to where the price is high.

> *"Without any tangible commitment from the company I have no binding obligation on me, except if you know that you are indebted to the company you will know that he has some rights over the tomatoes you produce"*
>
> *"If they do not give you any seed or input they should not complain if you sell it to where you will get highest profit, but if you receive seed or fertilizer or pump machine or both you already know that you have to supply the company even if the price is the least favourable because you collected their inputs except if you don't want go back next time."*

5.4.3. Farmers' Determinants of Contract Participation

Farmers are the key downstream stakeholders whose production and marketing decision has a consequence on the upstream stakeholders, notably, processors. They are constantly being faced with the common economic problems of what to produce and what market to sell to,

which are ex-ante decisions. The focus group discussion revealed that before production, farmers often decide whether to participate in the processor's contract and produce tomatoes for the company or produce their tomatoes and sell them to traders or any buyer in the local market. The following themes emerge from the focus group data that influence farmers' decisions on whether to participate in the contract:

a. Transaction costs

i. Entry cost: Cost of entry into the processor's contract market, which arises due to asset specificity (quality - specification), was believed to impede farmers' participation in the DTPP market. Farmer participation in the DTPP contract entails producing high-quality tomatoes that meet the processing requirements. High-qualities tomatoes here give a high percentage of Total Soluble Solids (degree of Brix), which are improved varieties that are big in size, firm, and have less water content. Although the farmers in the focus group revealed that the processing company provides farmers with some improved seedlings and other production inputs at a given cost, payable in kind under a resource-providing contract arrangement (production contract), a farmer must pay collateral of N33,000 per hectare to receive the hybrid seedlings from the company, which deprived many farmers of the opportunity to participate in the contract.

> *"The thing is, they will not give you the seed even if you accepted the offer until you pay for the seeds in cash or they give you the seedlings and pay from your harvest, but you must give collateral and this collateral is about N33,000 per hectare."*

Furthermore, most focus group participants believed that some farmers could not afford to buy expensive seeds that would meet the processor's requirements. Others will not want to invest their huge cost of production to produce tomatoes for the sake of only one market. Therefore, most farmers prefer producing local tomato varieties of their choice, which is less expensive, more resilient to local conditions, and can unconditionally be sold to any available buyer in the local market. This is mirrored in other countries, like Ghana (Robinson, 2012).

> *"Company has the specified variety they need, and the seeds are very expensive because some hybrids seeds cost about N8/piece of seed, why not produce what you can afford. "*

"I do not deal with the company, I always prefer selling to the fresh market where you can produce whatever you can afford to and can be sold and on cash and carry. Sometimes if you are lucky, you will get more profit than in the company" individual

ii. Delayed Delivery: Farmers in the focus group complained that based on the contract arrangements, farmers are responsible for transporting the harvested tomatoes to the delivery place. However, the delivery place often became densely populated by farmers who supplied their tomatoes, and it takes farmers an exceedingly long time before their tomatoes are screened and accepted by the company. Some farmers may spend days waiting in a queue, which adds to the volume of losses and other costs of transactions. Thus, the participants believed that most farmers chose not to participate in the DTPP contract because of this delay.

"…when I was told the company is accepting tomatoes from all farmers, I first went go there to observe the process, I found that people have to follow a queue and to be honest I will not be able to follow a queue to sell my tomatoes. You will take your tomatoes to the company since 12pm but you will not be able to get yourself through until mid-night, and this honestly stopped me from participating."

b. Uncertainties

i. Fresh Market uncertainty: The focus group revealed that some farmers participated in the DTPP contract because of the fresh market uncertainties. Tomato farmers constantly fear the market situation because of the volatile nature of the fresh market price, which can neither be pre-determined nor influenced. Most have learned from the terrible experience of bad market outcomes that sent many out of business.

" Whether we like it or not this company to us is a blessing because even if tomato prices in fresh market will reach up to N5,000 I will sell it to company at N3,000, because I have a guaranteed unlike fresh market."

"*In fact, the entire tomato production is an uncertainty but with the company you are at least better."*

"As I have told Gwari stuffs has no price control, the price is volatile, for example if 500 baskets were supplied the price may be low because higher quantity of tomatoes supplied in the market make its price low and low quantity supply makes the price go up. For example, in the morning you can

find more than 5000 baskets and sometimes 10,000 baskets therefore the market will be catastrophic when you have this massive supply."

"We mainly produce without certainty, we do not have any guaranteed market that you will be certain, the uncertainties are too much and at the end we only have to accept whatever market decides because it is either you sell it at the market price and go with whatever the outcome is or you got nothing at all."

"All this business is based on probability because at the end you have to accept what market decides."

However, with contract participation, farmers are secured and insured against fresh market uncertainties – the processor market is assured, and the price is guaranteed, enabling them to have a stable income.

"The type of farming arrangements that the Dangote processing company is currently doing has some guarantee because we already agree on a fixed price that will not change even if the fresh market price is low, you will be paid as agreed."

"One good thing with the company is, you will receive your payment into your bank account, while you are on your bed, no risk no stress, but you have to be patient honestly before the payment"

"Their price is fixed, and you have no fear about market, you know how much you will be paid unlike fresh market, in fresh market you don't know that"

ii. Uncertainty over the company's prospect: Participants in the focus group revealed that the processor often faces some technological failure, which results in the stoppage of tomato up-taking from the contracted farmers. Thus, many farmers incur losses that negatively influence most farmers' thinking regarding DTPP market. Most farmers in the focus group do not have good faith that the company has the full capacity to uptake all the tomatoes produced by the contracted farmers.

"We told you out of 100% only 10% of the farmers deal with the company and if all of us choose to supply the company, the company will not accommodate all of us."

Moreover, it is evident from the focus group that the uncertainty farmers face over whether the DTPP's market will be a reliable market over the coming years

continues to generate tension due to its intermittent nature of production. Thus, farmers prefer dealing with traders as the most reliable buyers of fresh tomatoes that buy tomatoes from them during the harvest period of each production season.

c. Contract Attributes/Arrangements.

i. Resource and service provisions: Most contracts in developing countries provide farmers access to inputs and extension services, which motivates their participation (Cai and Ma, 2015). From the focus group discussion, there is evidence that most of the farmers participated in the contract because of the hybrid seeds, extension and other services such as access to hiring of pumping machines provided by the agribusiness firm. The company often provides them with free extension services, which helps in enhancing the farmers' productivity and motivates them to participate in the contract.

> *"The company supports farmers with a lot of production training and extension services, sometimes they support us with pump machine especially the last year when the government started some repairs and blocked the river from reaching our production site"*

Moreover, for some serious farmers who prove their financial capability, the company offers them access to their land to cultivate for free, which motivates many farmers to engage in the contract.

> *"Like this year I was given a land to cultivate freely, and last year I was given a pump machine, but this year I got nothing, but I will do all the needful to supply them because they have done us a lot in the past."*

ii. Payment Arrangements: The payment received by the farmers is not immediate. Most farmers receive their payment at least two weeks after delivery – and it is evident from the focus group that some farmers, particularly those with pressing financial needs, prefer selling their tomatoes to the market on a cash and carry basis. Some farmers, especially resource-poor farmers, produce on credit (Cai and Ma, 2015). Thus, participating in a contract will make them economically constrained after delivery, and they lack the patience to wait and receive their payment after two

weeks. They prefer to produce their tomatoes and sell them to local markets where the payment is instant.

> *"How can you even think of the company while in the market no waiting in a queue and payment is instantaneous."*

iii. Production Time Specification: The production activities of most agro-processing companies in developing countries are intermittent (Fafchamps, 2004) and (Robinson, 2012). The processing company has a scheduled operation, and each farmer that accepts to participate in the contract must produce tomatoes at a time that synchronizes with the company's scheduled production period. Therefore, some farmers do not want to wait; they produce their tomatoes at their convenience and sell them to any available market.

d. Government Programs and Socioeconomic Endowments

i. Anchor Borrower Program: It is evident that many farmers were participating in the company for the first time, and their participation was motivated by the Anchor Borrower Program (ABP). ABP is a program introduced by the Federal Government of Nigeria to provide farmers with production input loans through an Anchor (large-scale processor), under a signed undertaking that they will not side sell. An anchor is a large-scale processor that the government supports to uptake tomatoes from smallholder farmers. The ABP aims to enhance value chain performance by connecting smallholder farmers with an assured market and supporting the growth of local agro-industries while ensuring an adequate supply of good quality raw materials to the industries.

> *"If not because of anchor borrower most of us have no business with company because the company has the farmers they are dealing with for long."*
>
> *"To cut it short, it is NATPAM that link us to company."*

ii. Financial Strength: The focus group revealed that most farmers with the financial strength to buy their production inputs hardly participate in the contract. Furthermore, the focus group participants unanimously agree that most of the farmers participated in the contract because of their weak financial strength, and they cannot afford to buy production inputs and rely on the inputs often provided by the company.

iii. Land size: As observed by Ton *et al.*(2018), Escobal and Cavero (2012) and Bellemare (2015), contracts exclude most farmers with small landholdings. It was gathered from the focus group that some farmers are willing to participate in the contract, but are hindered by their land size because the processing company prefers contracting farmers that have larger farm sizes.

> *"Ah! most of the farmers you see here that are in the contract have large farm sizes but people like me that produce less than 1 hectare the company will not even look at me."*

iv. Association Membership: It was observed from the focus group that association membership is one of the major requirements considered by the contracting agribusiness company to offer a farmer a contract. Thus, farmers who are not registered members of farmer associations are not contracted. However, it was observed that the company contracts farmers without any association membership. The company regarded these farmers as loyal farmers who have been in contract with the company since its inception. Moreover, some farmers do not trust any form of farmer association and are not willing to register with the association to participate in the contract. Instead, they prefer to produce tomatoes and sell them in the nearby local market.

> *The problem is some of us will not participate in the association and if the company do not know you, association membership is their first consideration*."

v. Relationship with Traders: It is evident that itinerant traders have a long-aged relationship with some farmers. Although not all farmers have access to traders, most farmers in the focus group confirmed that their relationships with traders make it difficult for them to engage in agro-processors' contracts. Traders buy tomatoes from farmers all year round, and they often keep their prices higher than the price offered to farmers by the processor. Moreover, by selling to a trader, a farmer gets instant payment and incurs zero transport cost, and zero cost of loading as traders usually come with their trucks to the farmers' farms and upload the tomatoes they buy from the farmer.

> *"To be honest, most of us that have access to Itinerant traders in the east sell their tomatoes to them because the price is by far higher."*

"Transport is not an issue to some farmers, what is more important is better price, we can pay for any amount of money to transport our tomatoes to the market provided the price is better and we will remain profitable."

"Remember when you are taking tomatoes to company you have to pay transport and the payment takes time but for traders they will come with their truck, they pay for the loading and the payment is instant."

"…traders they will come with their truck, they pay for the loading and the payment is instant."

5.5. Market Intermediaries and their Role in the Supply Chain.

The qualitative data from both the focus groups and interview revealed that there exist market intermediaries moderating the transactions at the farmer-trader and farmer-processor interfaces. The intermediaries are mostly farmers that have access to both traders in the southern part of the country and have had a contact with the DTPP since its inception. Most of them has a vast experience in the tomato business and majority of them are relatively wealthy as reported by one of the interviewees.

> "like me I have connection with both traders and the processing company. Most of the traders in the south called me to get information and likewise the company when the want buy tomatoes from market" interviewee 2.

Unlike in the developed market where the intermediary's critical role is connecting producers and consumers, in developing countries their role is more of exploiting the farmers. For example, Fafchamps (2004) found that in Kenya and Zimbabwe there exist market intermediaries that know potential buyers and played a crucial role of facilitating exchange between farmers and buyers of their commodities. Market intermediaries were accused of exploiting farmers vulnerability by taking advantage of their low bargaining power (Mazengo, 2014). Regardless of the production costs, market intermediaries often seduce farmers at harvest time and offered them very low prices. The qualitative data revealed that these intermediaries maximize their profit without any investment.

5.5.1. Intermediaries at the Farmer-Trader Interface

It was established from the in-depth interview data and field observation that most of the Traders live in the far southern part of the country, and they rely on their agents who give them market information on a daily basis. These agents are mostly who have a long-term

business relationship with the traders over the years, and they live in the production areas. These farmers have access to traders and are aware of the price that traders are willing to offer. They went round the farmers' farms during harvest to buy tomatoes on behalf of the traders, load them on a truck and send them to traders who lived in the Southern region. They persuade farmers to sell tomatoes at a very low price compared to the price traders are willing to offer.

> *"for example, like me he will send me his money at specified price determined by the market and I will go to the farmers, offer them my own price, assemble the tomatoes in my farm and send it to him in Lagos, in fact for over 5 years he has never show up in the market" Participant 4*

Most of the farmers that are not in contract have no access to Traders. After harvesting they are left with no option than to sell their tomatoes at a low price to buyers particularly the agent coming to their farms at harvest time to buy tomatoes. It was also evident from the literature that even those farmers that have access to market cannot dictate the price due to the small quantity and are forced to sell their agriculture produce to intermediaries at a marginal price (Omamo, 2007). And the intermediaries sell the products at a relatively high price and get higher profit without investing anything.

Moreover, one of the focus group participants revealed that they rely on these intermediaries for some financial support and as most of them have poor economic conditions and cannot afford to buy seed, fertilizer, and other inputs during the cropping season. This financial support from the intermediaries compromises the farmers' bargaining power.

> *"there was a time when I cannot buy even a seed and I don't have any source of getting them, one of the people who is buying tomatoes from me was the one who borrowed me some money to buy seeds and fertilizers" Participant 5.*

5.5.2. Intermediaries at the Farmer-Processor Interface

The study established that the market intermediaries have not played any significant role in facilitating the contract negotiations between farmers and processors. The DTPP's contract is open to all farmers willing to participate. However, the interview data revealed that the processing company adopted some farmers to serve as their agents to outsourced tomatoes for them from other farmers that do not partake in DTPP's contract. These farmers acting as DTPP's agents are mostly the loyal farmers that have been with the company for ages as the interviewee revealed.

> "we also buy tomatoes from spots market through some of the farmers who are our agents, we give them the fixed price and they went to market and buy from farmers at price lower than our fixed price"

These farmers (agents) were given an opportunity to be buying tomatoes from the spot markets on behalf of the company. The company set up a price at which the agents will buy a tomatoes on behalf of the company and the quality standard expected by the company. Thus, the farmers (agents) seduced farmers to sell the tomatoes at a low price.

Moreover, beyond just the agents recognized by the DTPP some of the contracted farmers that have contract with DTPP often buy tomatoes from the other farmers at a price lower than the contract price and sell them to the DTPP. Majority of tomatoes farmers are eager to sell their tomatoes and struggle seriously with market reliably and perishability, which take away their bargaining power. Thus, they can be easily persuaded by the other farmers that have an existing contract to sell their tomatoes to them at a lower price because the payment is often instantaneous.

5.6. Discussion

5.6.1. Contract Arrangements in Tomato Markets

One of the critical roles of a contract is to enhance coordination among the economic agents (Ajwang, 2020; Williamson, 1979). Thus, economic agents will go for contract farming arrangements to coordinate the transaction. The qualitative exploration revealed two major forms of contractual governance in Nigeria's tomato markets. One is classical contracting, referred to as market governance (Zhang and Aramyan, 2009). Classical contracting is a typical contractual arrangement at the farmer–trader interface. Traders often arrive at farmers' farms during harvest to buy tomatoes from them without any prior agreement. They often offer farmers a price that is higher than the price that a farmer could receive in a nearby fresh market and slightly higher than the contract price. Thus, price is the basic rule of exchange under this contract arrangement. The price is determined by the quality and volume of tomatoes and the number of traders arriving at farmers' farms. This observation is the same as observed by Fafchamps (2004) among Traders in Kenya, Zimbabwe and Ghana. The DTPP adopts bilateral contracting to ensure an adequate supply of high-quality tomatoes. As Fafchamps (2001) observed, in developing countries where transaction partners often

generate a fly-by-night concern, contract farming is the dominant form of contractual arrangement used by most contracting firms to minimize opportunism.

Although Ton *et al.* (2018) have argued that contract farming in the context of developing African countries is far from monolithic, Rosch and Ortega (2019) and Luo *et al.* (2013) observed that most contract designs are characterized by a take-it-or-leave-it price fixed by the contractor based on a specified quality standard. These observations are consistent with the current study, as the qualitative data revealed that most processor contract prices are fixed and based on certain quality standards. As observed in Bijman (2013) and Bellemare and Lim (2018), some contracting firms include the provision of inputs and services in their contractual arrangements to address input market uncertainties. In the current study, the interview data revealed that the DTPP market engaged some farmers under a resource-providing contract, which provides farmers with production inputs and technical and extension services.

Furthermore, qualitative data revealed that contract arrangements between farmers and the DTPP are wittingly agreed upon with the help of the leadership of farmer associations that serve as a guarantor to farmers and brokers between the farmers and the DTPP. This is consistent with Poku *et al.*(2018), Ruml *et al.* (2021), Kumar (2008), Ton *et al.*(2018), and Ruml (2020), who found that agribusiness firms use production contracts where firms are involved in the production and where the conditions for buying and selling are well defined and agreed upon wittingly before production starts.

In addition, the two contractual governances identified in the study area were observed to be influenced and shaped by market intermediaries. For instance, under classical contracting arrangement often practiced by Traders, it is not all farmers that have access to traders. Thus, the intermediaries that have access to market information and who were acting on behalf of traders often drive down the price in the local market and get maximum profit without investing anything. This observation is consistent with what was observed by Robinson and Ngeleza (2011) in Ghana where intermediaries charged higher prices and pay farmers a very low price. Similarly, under bilateral contracting arrangements, the contracted farmers take advantage of their contract to buy tomatoes from other non-contract farmers at a low price compared to the contract price and sell it to the processing companies.

5.6.2. Determinants of Contract Participation at the Farmer–Processor Interaction

Williamson's (1979) transaction costs economics explains why some economic agents buy, others sell, and others do not participate in markets. Evidence from various studies, such as Osebeyo and Aye (2014b), and Escobal and Cavero (2012) that are conducted on perishable commodities, found that costs of market entry associated with asset specificity in a contractual transaction deprived some smallholder farmers of an opportunity to participate in the agro-processor's contract. Similarly, Ajwang (2020) found that the cost of market entry is an important barrier to contract participation for farmers of a non-perishable commodity. In the current study, the findings from the focus groups are consistent with the evidence found in the above literature. Farmers believed that the majority were impeded by the N33,000 a farmer must pay under a resource–providing contract to receive hybrid seedlings from the processor or the amount that he must invest for a high-quality seed that meets the processor's requirement under a non-resource-providing contract arrangement. Furthermore, the focus group data revealed that the delays faced by farmers during the delivery were believed to discourage some farmers from participating in the agro-processor's contract because it adds to the transaction costs and harvest losses incurred by the farmers while waiting to deliver their tomatoes. This finding is closely similar to Alene *et al.* (2008) and Woldie and Nuppenau (2011).

As stressed by Williamson (1993), one of the key elements that facilitate a contractual relationship is good faith. It is evident from the focus group data that farmers believed that the price in the fresh market is highly unpredictable – and they can neither be determined nor influenced. However, they were impeded by the perceived uncertainty over the company's prospects. Farmers believed that the company could not uptake all the tomatoes produced by the contracted farmers. This belief was informed by the technological failure that farmer perceived the company often experienced during its production processes. Thus, most farmers develop fear and have no confidence in the processing market. This is in line with Zhang and Aramyan (2009) and Geyskens *et al.* (1998), who observed a negative association between relationship quality and environmental uncertainty.

Contract attributes are an essential determinant of contract participation among smallholder farmers in developing countries (Ochieng *et al.*, 2017). and (Abebe *et al.*, 2013). For instance,

Blandon *et al.* (2010) found that farmers in the fresh fruit and vegetable sector prefer markets whose characteristics are similar to traditional spot markets, where the transaction is based on cash and carry. This finding is in line with this study. All the farmers in the focus group believed that most farmers shunned DTPP contract because of the payment arrangement that took them at least two weeks to get paid. Although, the price is fixed, which transfers most of the risk to the company and insures farmers against market uncertainties. Most farmers in focus groups confirmed that they prefer a market with immediate payment, even if the price is slightly lower. Furthermore, Ruml (2021) found that farmers are more likely to participate in a contract that provides them access to production inputs and other services tenable only through contract participation. This is also consistent with the current study. Most of the focus group's farmers revealed that they participate in the contract only because of the contractual provisions that would otherwise be unavailable to them.

The role of farmer socioeconomic characteristics in determining contract participation is well documented in the literature. For example, Escobal and Cavero (2012) and Abate *et al.* (2021) found that farmers with high income and diverse sources of income participate more in the contract because they are more able to deal with the complexities that the contractual opportunities entail. Similarly, Bezabeh *et al.* (2020) found that wealthy farmers that owned livestock were more likely to participate in the contract. These findings are consistent with the current study, as the focus groups revealed that the most financially strong farmers often deal with contracting companies.

Moreover, Kutawa (2016) and Vassalos and Li (2016) found that farmers with large land sizes are more likely to participate in the contract. Farmers that produce tomatoes on a large scale are more comfortable participating in the contract because of the market assurance. These pieces of evidence are consistent with the findings of this study, as it was revealed from the focus groups that most of the farmers dealing with the company are those that produce tomatoes on a large scale. However, this finding disagrees with Dubbert (2019), who found that small-scale cashew farmers are more likely to participate in the contract than large-scale farmers because the local market is not reliable, offers low prices, and not all farmers have access to traders.

Farmers' social networks, such as association membership, are sometimes considered collateral by some contracting agribusiness firms (Antia and Frazier, 2001). For example, Au

and Culas (2021) found that some contracting agribusinesses consider a membership of a cooperative association as a requirement for a contract. The association membership makes it easier to get information about the farmer and his previous history of contractual transactions. Similarly, the focus group data revealed that membership in a registered association is a core requirement for a contract. However, this requirement impeded many farmers from participating in the contract, as most were non-registered members. This finding disagrees with Bezabeh *et al.* (2020), who found a positive association between cooperative membership and contract participation because, unlike NATPAM membership, whose membership benefits are unknown to farmers apart from ABP participation, cooperative membership provides a well-defined benefit to the farmer, and he can use his membership as a collateral.

The impact of contract farming on the welfare of participating smallholder farmers is hugely documented in literature such as Miyata *et al.* (2009), Bellemare (2010), Bellemare and Lim (2018), Sahara *et al.* (2015), and Bezabeh *et al.* (2020). These reported outcomes attract government intervention in various developing economies to enhance the integration of smallholder farmers into a high-paid value chain and strengthen their competitiveness (Kumar *et al.*, 2013). The qualitative data revealed that most farmers are motivated to participate in the contract because of the Federal Government intervention through the Anchor Borrower Program. The farmers receive production inputs from the government through the anchor, a large-scale processing company that agrees to uptake tomatoes from the farmers on the agreed fixed price pegged by the government. This finding is closely similar to Kaur and Singla (2018) who found a positive association between government intervention and contract participation.

A wide gender gap in contract participation has been spotted in contract participation among farmers due to religious and cultural reasons. Northern Nigeria is a Muslim-dominated community, predominantly Hausa and Fulani by ethnicity. Most of their cultural values are integrated into their Islamic religion or driven from it. Therefore, either interaction of these two factors has genderized related economic activities and made it look like a men's business. Although there is no sanction for women committing to it, it is considered an abnormality. However, this is not the case in Southern Nigeria, a Christian-dominated community; for example, Abimbola (2014) found that about 25% of the farmers are female. Similarly, in

Ghana, tomato traders were dominated by the female gender, who are referred to as "market queens" (Robinson and Ngeleza, 2011).

5.7. Conclusion

This chapter uses a qualitative approach to understand contracts in Nigeria's tomato markets and explore the factors that determine contract participation at the farmer–processor interaction. The results revealed that two major contractual arrangements are dominant in Nigeria's tomato markets. First is classical contracting, a non-coordinated transaction between farmers and traders in the open fresh market where the price is the basic rule of exchange. Second is bilateral contracting, which is a vertically coordinated arrangement where a processor contracts the production of tomatoes under specified agreed terms and conditions whose violation can be regarded as a breach. Moreover, market intermediaries played a critical role in shaping these two contractual arrangements.

It concludes that cost of entry, delayed delivery, payment arrangement, perceived uncertainties over the company prospect, and lack of financial strength are the major barriers to farmer participation. At the same time, resource and service provisions and guaranteed prices were established to be the key factors that motivate contract participation. This suggests that agribusinesses will do better if they establish an organised delivery and payment plan in addition to the existing features of the contract. This will give farmers some confidence in the agro-processing market. In contrast, policymakers will do better if they pay attention to providing farmers easy access to improve seeds, technologies, and extension services. This will allow the less endowed farmers to participate in the agro-processing market.

6 Econometric Insight into Contract Compliance Behaviour at the Tomato Farmer–Processor Interaction in Nigeria

6.1. Introduction

This chapter aims to determine the factors influencing contract compliance behaviour amongst farmers contracted by Dangote Tomato Processing Plant (DTPP). Section 6.2 of this chapter explores farmers' socioeconomic and contract-related characteristics. Section 6.3 provides an exploratory description of farmers' transaction-level characteristics. Section 6.4 explains the logistic regression results of the factors influencing farmers' contract compliance behaviour. The section explains the joint significance of the variables included in the model, their significance level, and their effect on the dependent variable. Section 6.5 discusses the key findings of the results. Section 6.6 provides concluding remarks and highlights some policy implications.

6.2. Description of Farms' Household Head Characteristics

The results in table 4 below are the summary statistics of the farm's household head characteristics. The results showed that contract participation was dominated mainly by the male gender, representing about 98.24% of the farmers who participated in the contract; the remaining 1.76% were female. This wide gender gap may be attributed to the cultural and religious factors that hindered participation of female gender in extensive Agricultural activities. It further showed that the average age of tomato farmers in the study area is about 42 years. Moreover, the youngest (20 years old) and oldest tomato farmers (70 years old) in the study area participated in the contract, implying that contract participation cut across different age grades. The results further revealed that tomato farmers who participated in the contract had an average household size of over eleven persons, a minimum household size of one person, and a maximum of fifty persons. This large household size indicated a prevalence of polygamous marriage among farmers, further indicating some level of responsibility that may affect contractual commitments.

The average land size put to tomato production by the contracted farmers was about 2.6 hectares of land. The minimum land size cultivated by some of the contracted farmers was as low as 0.2

hectares, and the maximum land size did not exceed 13 hectares, which implies that most of the farmers contracted by the Dangote Tomato Processing Company were smallholder farmers who transact a small volume of tomatoes. Moreover, the results revealed that most of the farmers (48.77%) inherited their farmlands, about 29% acquired their lands through leasehold, about 4% through the communal system of land ownership, 1.4% of whom acquired their lands through gift, and about 17% of the contracted farmers acquire their lands through purchase. Furthermore, the average distance between farmers' farms and the delivery place is about 20 kilometres. The distance ranged from about 1km to 58 km from the delivery place. The average distance covered by farmers to access the company suggests that contracted farmers must incurred a reasonable to amount of transport cost to deliver tomatoes to the company.

Moreover, the average contract experience of 1.6 years indicated that the contracted farmers were new in the DTPP market. The least and maximum experience among the contracted farmers was 1 and 7 years, respectively, further confirming this observation. In addition, the results showed that most farmers (about 54%) participated in the contract because of the Anchor Borrower Program (ABP), which is a program Introduced by the government to link smallholder farmers to large–scale processors called Anchors. Furthermore, about 61% of the contracted farmers had a membership registration with the National Association of Tomato Growers, Processors and Marketers (NATPAM), the only existing and functioning farmer association recognized by the government and the DTPP. Most of the farmers probably registered with this association as membership is one of the key requirements for contract participation through the ABP. The association served as a guarantor to farmers that wanted to be engaged in a resource-providing contract, and it could be seen from the results that about 30% of the contracted farmers were under resource–providing contracts. While the rest (about 70%) were under a non–resource–providing contract.

Although the traders did not visit all farmers during harvest, as shown in the results, some farmers received as high as ten traders in a season. While on average, each contract farmer was visited by about four traders in a season, implying that the uncertainty of whether traders will show up at the farmers' farms during harvest was minimal. Moreover, the trade relationship between farmers and itinerant traders from the southern part of the country seemed stronger

than that between farmers and the contracting processing company (DTPP). It is evident from the results that an average farmer had about 3.2 years of trading experience or a relationship with itinerant traders. Moreover, some farmers' relationship with the traders is as long as 40 years.

Furthermore, the results revealed that most contracted farmers are broadly educated - they can at least read and write. For example, about 32% of tomato farmers who participated in the contract attended tertiary institutions, 12% attended junior secondary school, about 30% attended a senior secondary school, and only about 27% of the contracted farmers attended primary school or none. Thus, most farmers can understand the terms of the contract and make a more informed decision about their attitude towards the contract.

In addition, the results show that most of the farmers (66.30%) that participated in the contract had a wealth index that falls under the 25^{th} percentile. Farmers whose wealth index category was at the 50^{th} percentile constituted about 25% of the total farmers that participated in the contract. The wealth index category of the farmers above the 75^{th} percentile represented only 9.06% of the total farmers that participated in the contract - the minor wealth category. From these results, it could be deduced that most of the farmers that participated in the contract are poor. Moreover, the results showed that most of the contracted farmers (about 86%) were affected by the COVID-19 pandemic. Conversely, about 14% of the contracted farmers reported being unaffected by the COVID-19 pandemic.

Table 4: Summary Statistics of Farms' Household Head Characteristics

Variable	Count	Mean	SD	Min	Max	Variable	Count	(%)
i. Age of the Farmer (years)	268	41.51	10.23	20	70	xi. Land Ownership		
ii. Household Size (persons)	268	11.36	7.75	1	50	(1) Inheritance	139	48.77
iii. Land size (hectares)	268	2.6	2.34	0.2	13	(2) Leasehold	83	29.12
iv. Contract Experience with Processor (years)	268	1.59	1.17	1	7	(3) Communal	11	3.86
v. Years of Relation with Traders(years)	268	3.19	6.2	0	40	(4) Gift	4	1.4
vi. Number of Traders that visit the Farmer	268	3.55	2.49	0	10	(5) Purchased	48	16.84
vii. Farm Distance from Company (Kilometers)	268	20.01	22.26	1	90	Total	285	100
	Count	(%)				xii. Type of Contract		
viii. Gender of the Farmers						(1) Non-resource-providing	199	69.58
(1) Male	279	98.24				(2) Resource-providing	87	30.42
(2) Female	5	1.76				Total	286	100
Total	284	100				xiii. NATPAM Membership		
ix. Education Level						(1) Yes	175	61.4
(1) Primary or None	77	26.92				(2) No	110	38.6
(2) Junior Secondary	33	11.54				Total	285	100
(3) Senior Secondary	85	29.72				xiv. Anchor Borrower Program Participation		
(4) Tertiary	91	31.82				(1) Participant	154	53.85
Total	286	100				(2) Non-Participant	132	46.15
x. Wealth Index Category						Total	286	100
(1) Wealth Index at 25th Percentile	183	66.3				xv. COVID-19 Impact		
(2) Wealth Index at 50th Percentile	68	24.64				(1) Yes	244	85.61
(3) Wealth Index at 75th Percentile	25	9.06				(2) No	41	14.39
Total	276	100				Total	285	100

Source: Author's Survey 2022.

6.3. Description of Transaction Level Attributes

The results in table 5 below are the summary statistics of farmers' transaction level attributes. The results show that most of the tomatoes transacted by the farmers are Dangote hybrid varieties, representing about 56% of the total volume of transactions. This hybrid variety typically comes from the Dangote Tomato Processing Plant (DTPP) under a resource-providing contract arrangement. The remaining 46% of the total tomatoes transacted are the other varieties, independently sourced by the farmers under a non-resource-providing contract arrangement. On average, a tomato farmer made three (3) harvests per season. Depending on the temperature and the tomato variety, some farmers harvest only once, and others harvest as high as six (6) times per harvest period, as the results revealed.

Moreover, the results show that an average farmer contracted by the processor can harvest about 4000kg of tomatoes per season. Some farmers harvested more than 15,000Kg of tomatoes, while others harvested as low as 400kg per season. On average, a farmer received about 37 nairas per kilogram of tomatoes from the parallel market. This average price was about 3 nairas less than the contract price of 40 nairas per kilogram for the resource–providing contract and 7 nairas higher than the contract price of 30 nairas fixed for non–resource–providing contracts. The lowest and highest prices a farmer received per kilogram of tomatoes from the parallel market were about 19 and 73 nairas, respectively.

Furthermore, over 52% of payments made to farmers during the transactions were instant payments on a cash and carry basis. These payments were typical of the payments received by farmers that break the contract and sell to traders or other alternative markets. The remaining 48% of payments to the farmers were not instant. Payment was made some weeks after the transaction, which was typical of the farmers that complied with the contract and supplied to DTPP. These results imply that most transactions occurred in spot markets or with traders at the farm gate, which further confirmed that most farmers break most contractual transactions.

The average cost incurred by a farmer to transport a 55.7 kg basket of tomatoes to market was over 32 nairas. Some farmers incurred a transport cost of zero, mostly those with relationships

or access to itinerant traders who come to farmers' farms and buy tomatoes from them. In contrast, some farmers incurred as high as 460 nairas per 55.7Kg basket in transporting their tomatoes to market. This huge transport cost is incurred mainly by farmers who break the contract and sell the tomatoes to a distant market. In addition, the results further show that, on average, tomato farmers incurred a loading cost of about 19 nairas per 55.75 kg basket. At the same time, some farmers incurred a loading cost of zero. These was typical of farmers who transacted with the traders who buy tomatoes at the farm and often pay for the loading costs. In contrast, some other farmers incurred a loading cost of over 80 nairas per 55.75 kg basket, especially those that sell to the processing company or transport their tomatoes to a distant market in the southern part of the country.

In total, farmers made over 1300 transactions throughout the harvest season. Over 53% of these transactions were made to traders and buyers in parallel markets. In contrast, about 47% of the total transactions were made to the processor, DTPP, implying that farmers complied with the processor's contract for about 47% and reneged for over 53% of the total contractual transactions. Furthermore, about 41% of the total transactions were made during the peak harvest subperiod, during which most farmers started harvesting their tomatoes. About 30% of the transactions occurred during the early harvest subperiod, while over 29% of the transactions were made during the late harvest period.

Table 5: Summary Statistics of Farmers' Transaction Level Characteristics

Variable Description	Mean	SD	Min	Max
i. Quantity (in 1000Kg)	3.89	4	0.4	15.41
ii. Parallel Market price (in Naira/Kg)	36.81	14.54	18.67	73.04
iii. Transport cost/55.7Kg Basket (in Naira)	32.2	53.26	0	460
iv. Loading cost/55.7Kg Basket (in Naira)	18.82	20.28	0	80
v. Number of Harvest	2.96	1.55	1	6
vi. Contract Compliance Choice	Frequency	(%)		
(0) Not Comply	688	53.29		
(1) Comply	603	46.71		
Total	1291	100		
vii. Tomato Variety				
(0) Other Variety	557	42.71		
(1) Dangote Hybrid	747	57.29		
Total	1304	100		
viii. Payment Type				
(1) Not Instant	622	47.7		
(0) Instant	682	52.3		
Total	1304	100		
ix. Harvest Sub-periods				
(1) Early subperiod	391	29.94		
(2) Peak subperiod	533	40.81		
(3) Late subperiod	382	29.25		
Total	1306	100		

Source: Author's Survey 2022.

6.4. Investigation of Factors Affecting Farmers' Contract Compliance Behavior

6.4.1. Hypothesized Relation between some Critical Factors and Contract Compliance based on Empirical Literature

The results from other empirical studies summarized in table 6 below show that payment delay, market price, and transport cost (or distance to the delivery centre) are positively correlated with the contract breach, which implies that these variables are expected to have a negative association with farmers' contract compliance. However, land size, income, education level, resource provision, and cooperative membership are positively correlated with contract compliance.

Table 6: Summary of the Findings in the Empirical Literature on Contract

Independent variable	Study	Relationship with contract compliance
Payment delay	Cai and Ma (2015)	(-)
Quantity sold	Kumar *et al.* (2013)	(+)
	Robinson *et al.* (2012),	(-)
	Kumar *et al.* (2013)	(-)
Price differential	(Ton *et al.*, 2018)	(-)
	Repar *et al.* (2018)	(-)
	Rosch and Ortega (2019).	(-)
Transport cost	Osebeyo and Aye (2014)	(-)
	Escobal and Cavero (2012)	(-)
	(Guo *et al.*, 2007)	(+)
Education level	Cai and Ma (2015)	(+)
	Tefera *et al.* (2020)	
	(Vassalos and Li, 2016)	(+)
Land size	(Ton *et al.*, 2018)	(+)
	(Meemken and Bellemare, 2019),	(+)
Wealth	(Saenger *et al.*, 2013)	(+)
	(Kumar, 2008)	(+)
Association membership	Cai and Ma (2015)	(+)
	Au and Culas (2021)	(+)
	Kumar *et al.* (2013)	(+)
	(Ruml and Qaim, 2020)	(+)
Resource-provision	(Bidzakin *et al.*, 2020)	(+)
	(Ruml *et al.*, 2021)	(+)
	Cai and Ma (2015)	(-)

Source: Author's Literature Review

6.4.2. Endogeneity Test

Two variables; open market and quantity sold were tested for suspected endogeneity in the specified contract compliance model. The wald Chi-square test of exogeneity of open market price attached as Appendix vi was found to be insignificant, suggesting the acceptance of null hypothesis that the variable open market price is exogenous not endogenous. Similarly, the Wald Ch-square result of exogeneity of quantity sold attached as appendix viii was found to be statistically insignificant suggesting the acceptance of null hypothesis that the variable is exogenous. Therefore, having confirmed that open market price variable is exogenous and there

exist no simultaneity between the dependent variable and the instruments, the study rely on the estimated coefficients from the normal logistic regression results.

6.4.3. Logistic Regression Results of Factors Affecting Farmers' Contract Compliance Behavior

Table 7 below presents the factors influencing the farmer's contract compliance behaviour. Three different models were estimated with varying explanatory variables: the transaction level attributes, the household characteristics, and the interaction term. The Wald chi-square values in model (A), model (B), and model (C) are 241.36, 250.09, and 269.76, and the pseudolikelihood values are -180.10, -158.81 and -157.17, respectively. These test statistics tested the joint significance of the variables in the models and were all significant at a 1% probability – implying that the estimates of the variables included in the models are consistent estimates for the logistic model.

Moreover, the pseudo-R – squared values show that 79.7%, 80.9%, and 81.1% of the variations in the dependent variable in model A, model B, and model C, respectively, are explained by the dependent variables included in the model. It further shows that about 76% of the variables included in the model, including the interaction term (market price versus harvest subperiod), are significantly correlated with the dependent variable. Some of these significant variables have an odds ratio of less than one, which implies a negative correlation. While other significant variables have odds ratios of higher than 1, implying that the variables are positively associated with the dependent variable. However, the result interpretation and discussion are limited to model C, which is the full model of contract compliance behaviour.

For instance, payment type (1=not instant), which is significant at a 1% probability, has an odds ratio of 0.002, which implies that the odds of a farmer complying with the contract when the payment is not instant decreases by 99.8% compared to payment made immediately after delivery (based on cash and carry). Similarly, the alternative market price, which is significant at a 10% probability, has an odds ratio of 0.96, which implies that a 1 naira increase in price per kilogram of tomatoes in the parallel market decreases the odds of compliance by about 4%. The variable wealth index has four categories with odds ratios of 1.925, 1.039, and 0.235 for the

categories at the 50th, 75th, and above 75th percentile, respectively, compared with the 25th percentile category. From these categories, only the 75th percentile category is significant at a 5% probability and is negatively correlated with the dependent variable. The category has an odds ratio of 0.235, which implies that the odds of contract compliance for farmers under this category decreased by 76% compared to farmers under the 25th percentile category. Additionally, the number of traders that visited farmers' farms has an odds ratio of 0.832, which is significant at 5% probability, implying that an increase in the number of traders that visited a farmer at his farm during harvest decreases the odds of his compliance by about 17%. Meanwhile, the years of farmer relationship with the contracting processing company has an odds ratio of 0.786, which is significant at a 5% probability, implying that a year increase in relationship with the processor decreases the odds of compliance by about 22%.

Variety (Dangote Hybrid=1) has an odds ratio of 5.052, which is significant at a 1% probability, indicating that the odds of compliance increase by 400% when the variety transacted is the Dangote hybrid variety compared to the other varieties. The quantity sold has an odds ratio of 1.761, which is significant at a 5% probability, implying that a 1% increase in the quantity sold increases the odds of compliance by 76%. Moreover, transport cost tested significantly at 1% probability and has an odds ratio of 1.136, implying that a 1000 naira increase in transport cost increases compliance odds by 14%. The harvest subperiods have three categories with odds ratios of 7.126 and 0.992 for the peak and late periods, respectively, compared with the early subperiod. However, only the peak subperiod passed the significance test at a 10% probability. The odds ratio of 7.126 for the peak subperiod implies that the odds of contract compliance increase by about 600% during the peak subperiod compared to transactions made during the early subperiod.

Similarly, the education level has four categories with odds ratios of 1.175, 2.505, and 2.616 for Junior, Senior, and Tertiary levels of education, respectively. The odds ratio for the junior level of education is statistically insignificant. The odds ratio for senior secondary level of education is 2.505, which is significant at a 10% probability level, implying that the odds of compliance for farmers in this educational category increase by about 150% compared to the reference group (primary level of education or none). In addition, the odds ratio of 2.616 for the tertiary level of

education implies that the odds of contract compliance for farmers in this education category are about 162% higher than the primary level of education.

Table 7: Logistic Regression Results of Factors Affecting Farmers' Contract Compliance Behavior

Variable Description	Model A		Model B		Model C	
	Odds Ratio	SE	Odds Ratio	SE	Odds Ratio	SE
(a) Transaction costs						
i. Transport cost (in N1000)	1.106***	0.027	1.129***	0.029	1.136***	0.030
ii. Payment type (1=Non-instant)	0.003***	0.001	0.002***	0.001	0.002***	0.001
(b) Transactional Attributes						
i. Variety (1= Dangote Hybrid)	4.074***	1.576	5.088***	1.683	5.052***	1.654
ii. Log quantity sold (1000Kg)	1.660**	0.298	1.804***	0.318	1.761**	0.307
(c) Parallel Market price (Naira/Kg)	0.941***	0.015	0.936***	0.016	0.962*	0.021
(d) Harvest subperiods						
(2) Peak subperiod	1.096	0.446	1.042	0.450	7.126*	7.765
(3) Late subperiod	0.498**	0.172	0.464**	0.166	0.992	1.035
(e) Farmer Characteristics						
i. Education Level						
(2) Junior secondary			1.077	0.566	1.175	0.602
(3) Senior secondary			2.581*	1.329	2.505*	1.287
(4) Tertiary			2.475**	1.02	2.616**	1.080
ii. Association Membership (2=Non-Member)			1.929*	0.737	1.949*	0.748
iii. Anchor Borrower Participant (2=No)			0.787	0.305	0.787	0.311
iv. Household size			1.007	0.018	1.006	0.018
v. Land ownership						
(2) Leasehold			1.473	0.611	1.425	0.594
(3) Communal			0.927	1.165	0.881	1.137
(4) Gift			1.708	1.397	1.456	1.176
(5) Purchased			2.348**	0.868	2.315**	0.859
vi. Wealth Index Category						
(2) Index at 50th Percentile			2.010	0.829	1.925	0.806
(3) Index at 75th Percentile			1.019	0.485	1.039	0.497
(4) Index above 75th Percentile			0.259**	0.164	0.235**	0.149
vii. Years of Relationship with a processor			0.805	0.096	0.786**	0.093
viii. Number of Traders that visit the Farmer			0.840**	0.064	0.832**	0.063
(f) Covid – 19 impacts (2=No)			1.355	0.576	1.279	0.532
(g) Contract Provision (1=Yes)			2.439**	0.921	2.364**	0.889
(h) Subperiods vs Market price Interaction						
(2) Peak season vs Market price					0.948**	0.022
(3) Late season vs Market price					0.977	0.024
Pseudo R^2	0.797		0.809		0.811	

Source: Author's Survey 2022 *, **, *** =10%, 5%, and 1% probability

Moreover, the association membership (Non-Member=2) has an odds ratio of 1.949. This odds ratio implies that the odds of compliance for non-registered members of the National Association of Tomato Processors and Marketers (NATPAM) is about 95% higher than for registered farmers of NATPAM. Furthermore, the odds ratio for contract type (Resource–providing type=1) is 2.364, which is significant at a 10% probability, implying that the odds of contract compliance for farmers under a resource–providing contract is about 136% higher than the farmers under a non-resource-providing contract.

The land ownership system has five categories with odds ratios of 1.425, 0.881, 1.456, and 2.315 for leasehold, communal, gift, and purchase categories referenced to a based inheritance category. The odds ratios for leasehold, communal, and gift categories of land ownership are statistically insignificant. While the odds ratio of 2.315 for the purchase category is significant at a 10% probability, implying that the odds of contract compliance for the farmers in a purchase category is about 132% higher than the farmers in the inheritance category.

In addition, the results further show that the interaction of market price and harvest peak subperiod is significant at a 5% probability, and the interaction of market price and late subperiod is statistically insignificant. The odds ratios for the interaction of market price and peak subperiod computed by multiplying the odds for market price, peak subperiod, and the odds ratio of peak subperiod interaction with the market price is 6.37. This odds ratio means that the odds of contract compliance for farmers that transacted their tomatoes in the peak subperiod increased by 537% compared to those that transacted their tomatoes during the early subperiod when the price per kilogram of tomatoes in parallel increased by 1 naira. Although the odds ratio for the interaction of market price and late subperiod is not significant, the odds ratio of 0.96 obtained by multiplying the odds of parallel market price, late subperiod, and the peak subperiod interaction, implies that the odds of compliance for farmers that transacted in late subperiod decreased by 4% compared to the farmers that transacted in the early subperiod when the price increased by 1 naira.

The figure 13 below depicts the interaction of the harvest period with the market price generated using the Stata margins plot command. It shows that the probability of contract compliance is

higher within the peak subperiod when the price in the parallel market is less than 40 nairas/Kg, which is equivalent to the fixed contract price for resource–providing contracts. Moreover, it could also be seen that irrespective of the subperiod category, the probability of contract compliance decreases when the market price goes above the fixed contract price 40 nairas/Kg.

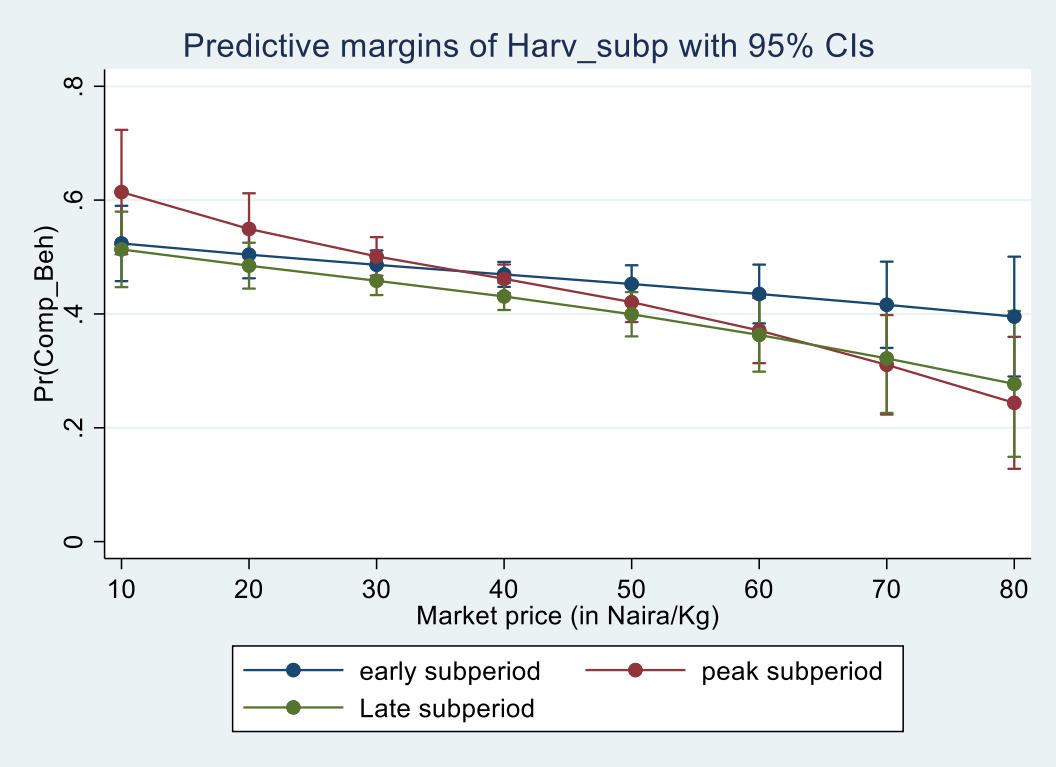


Figure 12 Price vs. subperiod harvest interaction

6.5. Discussion

Contractual breach at the farmer-processor interaction can be both or either way – as both can potentially breach the agreement. Although the empirical investigation is limited to farmers perspective, the study relies on the qualitative data to provide an insight into the causes of contractual breach from the perspective of the processor to balance the discussion.

6.5.1 Determinants of Farmers Contract Compliance

The logistic regression results revealed that most of the variables included in the model have the expected hypothesized relationship with the dependent variables. In particular, the odds ratio of the payment delay (not-instant=1) is negatively correlated with the farmer's probability of complying with the contract. The payment type adopted by the company, which was part of the

contract agreement, is that farmers are to receive their payment within two days after delivery. As highlighted by Kumar *et al.* (2013), payment delay is one of the major constraints affecting farmers' contract performance. Most farmers prefer transactions that are similar to that of traditional spot market.(Blandon *et al.*, 2010). This is because most farmers that purchase production inputs on credit may be economically constrained by payment delay, and they will break the contract and look for alternatives that offer a timely payment (Cungu *et al.*, 2008). Therefore, farmers with pressing financial needs easily break the agreement and sell their contracted tomatoes outside the contract to other market alternatives that offer them an instant payment (on a cash and carry basis). This finding is closely similar to the findings of Cai and Ma (2015), that found a positive correlation between delayed payment and low contract enforcement choice among farmers.

The results also suggest that farmers who harvest large volumes of tomatoes are more likely to comply with the contract. This compliance may be because of perishability and price uncertainties associated with transporting tomatoes over long distances to major urban consumption areas in the southern part of the country. The scale of production determines the volume of tomatoes produced by a farmer. Therefore, this could mean that farmers who produce tomatoes on a large scale are more likely to comply with the contract, which is consistent with Ton *et al.* (2018), and Vassalos and Li (2016) who found a positive association between the scale of production and farmers' performance in a contract.

Moreover, the parallel market price was found to be significantly negatively correlated with the farmers' contract compliance behaviour – implying that farmers break contracts for a better price option. As pointed out by Kumar *et al.*(2013), open market price generates unanticipated rent for the contracting agribusiness firms, increasing the benefits of contract breach among the contracted farmers. Thus, when the price in the parallel market is high, a rational farmer will break the contract to maximize his profit by selling the tomatoes to the higher-paid market. This result is consistent with Robinson *et al.* (2012), who found that contracted farmers always have the option of breaking contracts even if they are profitable in complying, provided that the fresh market remains. It is also in line with Rosch and Ortega (2019), Repar *et al.* (2018), and Ton *et al.* (2018), who found that price premium incentivizes contractual compliance.

Furthermore, the results show that contract compliance is higher during the peak subperiod compared to the early and late subperiod. This is because, during the peak harvest period, the price in the local market is often lower than the contract price due to glut, as highlighted by (Robinson and Ngeleza, 2011). In addition, the interaction of market price and harvest subperiods shows that parallel market price increment decreases farmers' contract compliance behaviour irrespective of the harvest subperiods.

Transport cost has an odds ratio that is significantly positively correlated with contract compliance behaviour – implying that the costs of transporting tomatoes to other markets have a positive impact on the farmers' contract compliance behaviour. Although it may sound insensible to say that the farther away a farmer is from the company, the more likely he is to comply with the contract. Therefore, the study argued that transport costs have no negative effect on farmers' contract compliance behaviour among tomato farmers because the focus group findings revealed that most farmers believed that transport cost is never an issue provided the price is high. The price offered by the company is always higher than the price in the nearby local market, especially in the peak harvest season. Moreover, most of the contracted farmers under investigation live in a remote area, far away from the company and are not easily accessible by itinerant traders. In addition, the focus group revealed that some of the contracted farmers are under the Anchor Borrower Program (ABP), which covers the cost of transporting tomatoes to the delivery centre. This finding is inconsistent with Cai and Ma (2015), who found a positive association between contract breach and distance to the delivery place. It also disagrees with Osebeyo and Aye (2014) and Escobal and Cavero (2012), who found that farmers often transact their tomatoes to a market with the least transaction costs.

The role of education in influencing farmers' rational decisions and positive attitudes towards contracts is documented in various empirical literature such as Cai and Ma (2015), Guo *et al.* (2007) and Tefera *et al.* (2020). This empirical evidence documented in the literature is consistent with the results of this study's logistic regression, showing a significant positive correlation between the farmer's education level and his contract compliance behaviour. Additionally, the wealth index of farmers is significantly and negatively correlated with the farmers' contract compliance behaviour. This result is closely related to the findings of Lu *et al.* (2017), who found

that an increase in income from other off-farm diversification discourages farmers' engagement and commitment to contract. This finding disagrees with the previous work of Escobal and Cavero (2012), who found that more economically endowed farmers are more likely to perform better in a contract because of their ability to deal with the complexities that the contractual transaction entails. This result is supported by the focus group data which revealed that most wealthier tomato farmers only engage in contract to insure themselves against market uncertainties. They are often called *risk takers* because of their consistent attitude of sending a large volume of tomatoes to the southern region of the country in search of higher prices. This consistent behaviour is often informed by the belief held by the farmers that one successful transaction in the urban market of the southern part of the country is enough to cover previous years' losses.

The role of farmer associations and cooperative societies on contract performance is documented in the literature. For example, Au and Culas (2021) found that agribusiness firms are likelier to engage farmers that are members of cooperative farmer associations to minimize contractual breaches. Similarly, Cai and Ma (2015) found a positive relationship between contractual compliance and membership of cooperative association. However, this field investigation gives an inconsistent result. The odds ratio of association membership is significant and negatively associated with the farmers' contract compliance behaviour, implying that non-members of NATPAM are more likely to comply with the contract. This claim is supported by the focus group findings, which revealed that most of the farmers participate in the contract for the first time and only register with the NATPAM because it is a requirement for them to receive the government intervention through the Anchor Borrower Program (ABP) that links farmers to large–scale processors (anchors). Moreover, some farmers who are registered members of NATPAM have limited understanding of the value of their membership and why they are registering because it is a new and the only existing farmer association.

Moreover, resource-provision has an odds ratio that is positively and significantly associated with the farmers' contract compliance behaviour, which indicates that farmers under a resource-providing contract comply more with the contract. This compliance may because farmers under a resource-providing contract struggle with production inputs and may not want to lose the opportunity to access those contractual provisions. This finding is consistent with Kumar *et al.*

(2013), Cai and Ma (2015), Ruml and Qaim (2020), Bidzakin *et al.* (2020) and (2021), who found a positive association between resource provisions and contract performance among farmers.

6.5.2 Processor's Contractual Compliance.

Although processor's claimed to have settled the farmers within the agreed period, focus group discussions revealed that most farmers received there payment at least about two weeks after delivery, which is a breach of agreement enclosed in the contract clause that a farmer will receive his payment within 48 hours after delivery. Thus, it is sensible to say that the notable breach of contract identified by the study from the side of the contracting firm is payment delay.

However, in-depth interview with the processing company revealed that the payment delays faced by some farmers is attributed to their dishonest attitude of mixing the contracted produce with low-quality tomatoes that take them the company very long time to sort it out. The sorting process takes the processing firm's much time more than they expected, making it challenging for the company to settle all farmers within the agreed payment period. Even though the breach of DTPP's contract is excusable this payment delay it has a tendency to affect the honest farmers that comply with the quality standard, which may induce bad behaviour among them.

The finding is inconsistent with studies like Zhang and Aramyan (2009) and Luo *et al*.(2013) argued that found that in developing countries contractual breach is often from the side of the farmers and rarely from the side of the contracting agribusiness firms, as most of the firms find it more cheaper to buy rather than produce the raw materials. However, it is consistent with Fafchamps's (2004) study, which found that in Sub-Saharan Africa, specifically Kenya, Ghana and Zimbabwe, farmers suffer from breach of contract coming the side of contracting agribusiness companies in form delayed or non-payment.

6.6. Conclusion

This chapter used a logistic regression model to investigate the determinants of contract compliance among farmers contracted by the Dangote Tomato Processing Plant and a qualitative approach to understanding the cause of the breach from the company's side. In particular, the impact of the payment type (not-instant=1), quantity harvested, market price, transport cost, education level, NATPAM Membership, wealth index, experience, and resource provisions on

contract compliance. The qualitative data revealed that the delayed payment from the side of the processor might be excusably connected to farmers' dishonesty in mixing different varieties. In contrast, the logistic results revealed that the probability of contract compliance increased with increased quantity harvested, transport cost, education level, and resource provision and decreased with an increase in parallel market price, association membership, non-instant payment and wealth index.

The negative coefficient (odds ratios greater than one) for payment type (not-instant=1) and parallel market price in the model implies that incentives and devising a timely payment plan is critical for efficient contractual transactions. The positive association between quantity harvested and contract compliance suggests that agribusiness firms will do better if they consider contracting farmers with large landholdings. Moreover, the education level of the farmers correlates positively with contract compliance, implying that more educated farmers will do better in a contract.

7 Econometric Investigation of the Determinants of Expected–Observed Compliance Behaviour Gap among Contracted Tomato Farmers in Nigeria

7.1 Introduction

The previous chapter relied on transaction-level data to examine factors determining a farmer's contract compliance choice each time he sells his tomatoes. However, relying on transaction-level information may be misleading and misinform policies that aim to enhance contracts. Therefore, this chapter examines factors influencing farmers' expected–observed compliance behaviour gap. This chapter employed household head-level data that combined the household head attributes and average transaction-level information. The farmers' expectations in the ex–ante period of the contract may often change in the ex–post due some factors or unforeseeable events. Understanding what widens or minimizes the expected–observed compliance behaviour gap is paramount to developing policies that enhance contracts. Therefore, the study used ordered logistic regression to investigate the determinants of the expected–observed compliance behaviour gap among the farmers.

Section 7.2 provides an exploratory analysis to understand and describe the distribution of expected and observed compliance levels among the farmers. It further measures the level of association that may exist between farmers' expected and observed compliance using Goodman and Kruskal's Gamma. Moreover, it describes the expected–observed compliance behaviour gap seen to have existed among the contracted farmers. Section 7.3 explains the results of the three different ordered logistic models concurrently. The explanation compares the output from the three models for each significant variable. Section 7.4 discusses the critical variable of interest based on the literature and the study area context, focusing more on the expected–observed compliance behaviour gap model. While section 7.5 provides some concluding thoughts based on the empirical evidence found.

7.2 Exploratory Analysis

7.2.1 Description of Farmers based on their Expected Compliance

The bar chart illustrated in figure 14 below is the descriptive statistics of farmers' expected compliance. The results revealed that before the harvesting period, at the contract formation stage, 32.3% of the contracted farmers reported their expected level of compliance as low. This category of farmers may be those under a marketing contract arrangement who are mainly independent, and the company has less influence over their production processes as they provide them with no production input or services. In contrast, only 23.4% of the respondents reported their expected level of compliance as high. This category of farmer may be those under a production contract arrangement who have received inputs and services from the contracting agribusiness firm (Dangote Tomato Processing Plant). Thus, they may claim a higher level of compliance as proof of sincere commitment and intent towards the contract. Furthermore, about 44.3% reported their level of expected compliance as moderately high. This may be a category of contracted farmers who have received inputs and services from the company but also have access to other markets, and they may not guarantee compliance when the other alternatives become more favourable at harvest time.

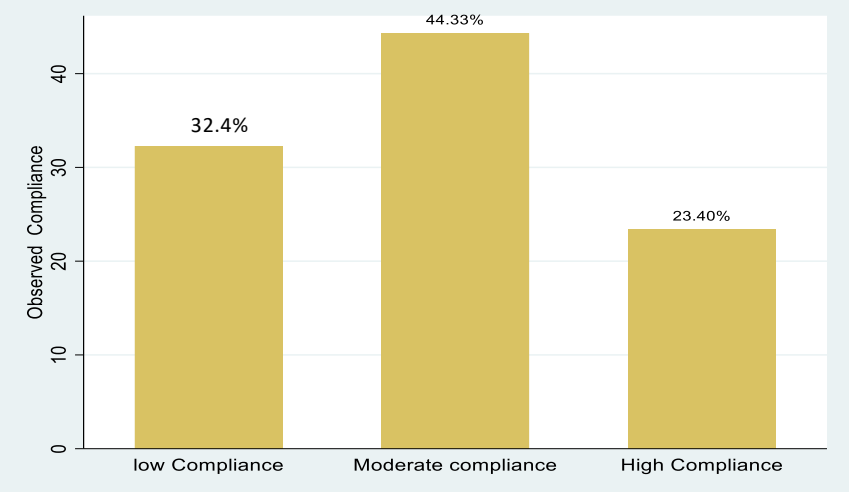


Figure 13: Observed Compliance Distribution

7.2.2 Description of Farmers based on their Observed Compliance

The bar chart illustrated in figure 15 below is the descriptive statistics of farmers' observed compliance computed for the entire harvest period. Farmers' observed compliance was computed by dividing the number of transactions made to the company by the total transactions made per season. The result of the computed average compliance was then categorized into low, moderate, and high. The results show that 28.17% of the farmers fell under a low compliance category of observed compliance. In contrast, 8.45% and 63.38% of the farmers fell under a moderate and high category of observed compliance. These results suggested that most farmers either under-report or over-report their level of contract compliance. This is explained in subsection 7.2.4.

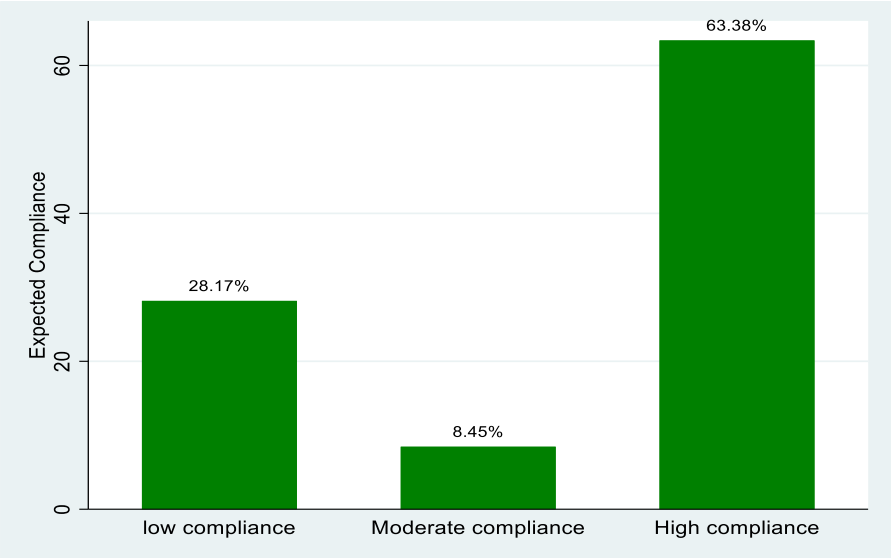


Figure 14: Expected Compliance Distribution

7.2.3 Goodman and Kruskal's Gamma Test for Expected and Observed Compliance Level

Table 8 below presents the results of Goodman and Kruskal's Gamma, which test whether farmers' expected level of compliance is associated with their observed compliance level. From the results, it could be seen that 27.7% of the farmers reported their level of expected compliance as low, while about 32% of the farmers were observed to be in the low compliance category, implying that the observed and expected level of compliance among farmers is closely the same. However, the percentage expected and observed compliance for the moderate compliance category are 8.6% and 44.2%, respectively, which shows wide discord. Similarly, high compliance category of 63.7% for expected compliance was found to be only

23.4% for observed compliance, suggesting that most farmers that reported high compliance could not fulfil their expected compliance. Furthermore, Goodman and Kruskal's Gamma test was found to be insignificant, implying the acceptance of the null–hypothesis that there is no association between the expected and observed compliance. Though insignificant, the low positive value of 0.012 for Goodman and Kruskal's Gamma test showed a weak positive association between the farmers' expected and observed compliance behaviour. Moreover, the extremely low counts for the moderate category of expected compliance may affect the strength of the association. Thus, these results do not suggest an absolute discordance between observed and expected compliance. The subsequent subsection described the contracted farmers' expected–observed compliance gap.

Table 8 Results of Goodman and Kruskal's Gamma for Observed and Expected Compliance

Expected Compliance		Observed Compliance			Total
		Low Compliance	Moderate compliance	High Compliance	
Low compliance	Count	27	32	18	77
	% of Total	9.7%	11.5%	6.5%	27.7%
Moderate compliance	Count	6	12	6	24
	% of Total	2.2%	4.3%	2.2%	8.6%
High compliance	Count	57	79	41	177
	% of Total	20.5%	28.4%	14.7%	63.7%
Total	Count	90	123	65	278
	% of Total	32.4%	44.2%	23.4%	100.0%
	Value	Asymptotic Std. Error	Approximate T[b]	Significance	
Gamma	0.012	0.097	0.125	0.901	

Source: Author's Survey, 2022.

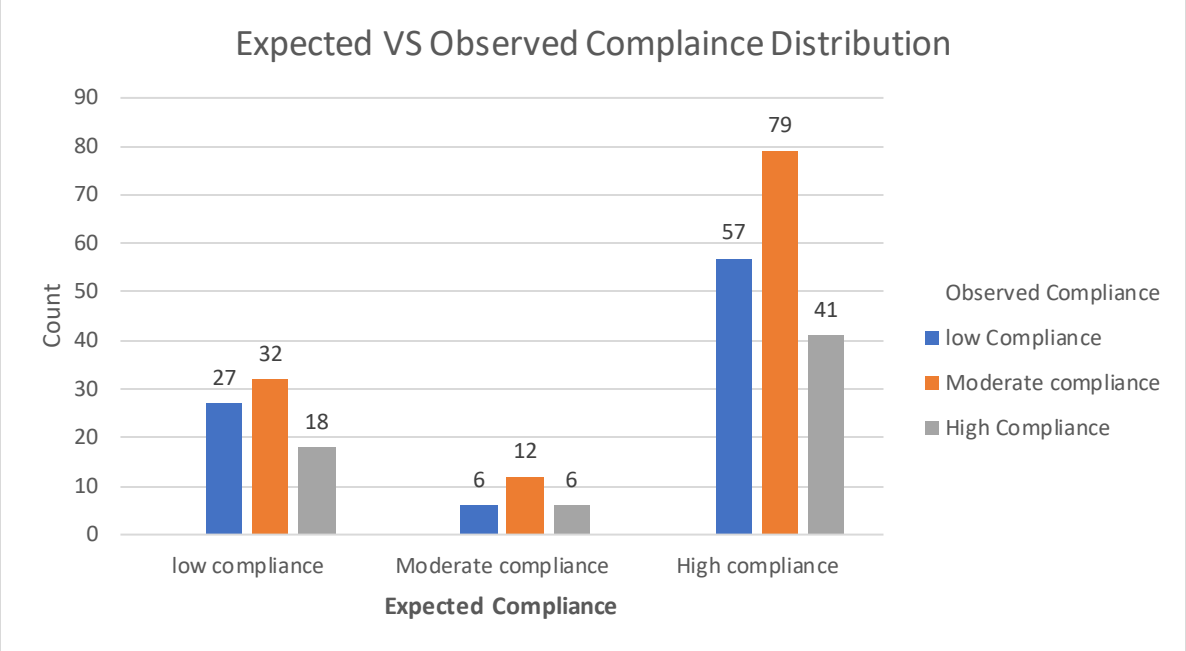


Figure 15 Expected VS Observed Compliance Distribution

7.2.4 Description of Farmers Observed–Expected Compliance Gap

The bar chart illustrated in figure 17 below shows the descriptive statistics of farmers' expected–observed compliance behaviour gap. The results revealed that only 28.87% of the farmers were observed to actualize their expected level of compliance. While 20.14% of the farmers under-reported their level of compliance, implying that some farmers that expected to be in the low or moderate level of compliance, were found to be in the compliance category higher than their expectations. Furthermore, most of the farmers (51%) over-reported their compliance level, implying that most farmers who reported their level of compliance to either be high or moderately high was observed to be at a lower level of compliance. These results suggest that farmers' intentions to comply were formed, but the commitment to actualize the intention was either lower or higher than expected. However, for some farmers, it is somewhat precise.

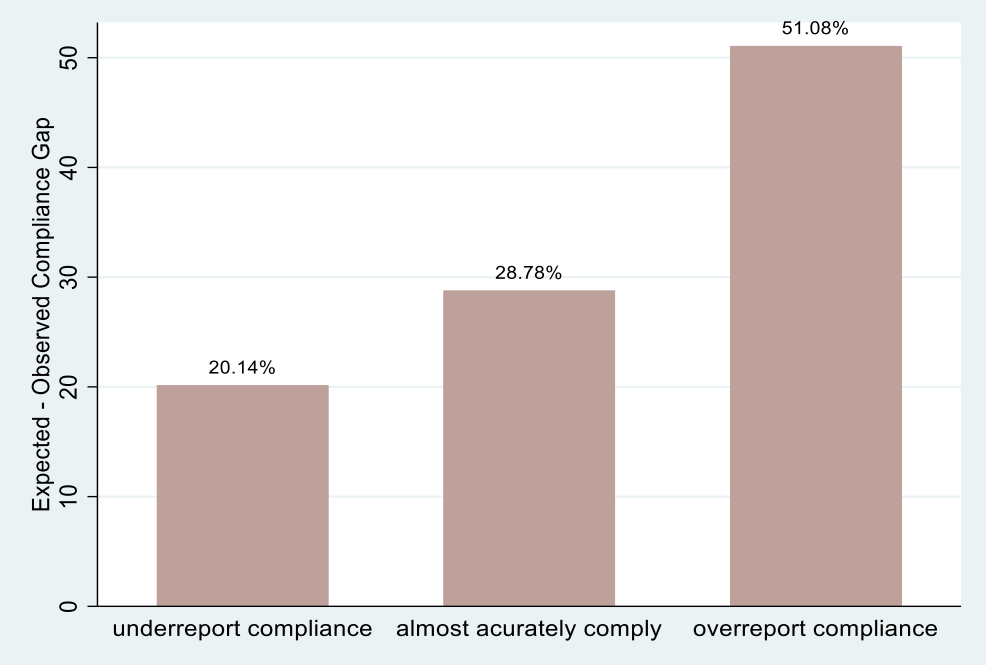


Figure 16: Expected–Observed Compliance Gap Distribution

7.3 Econometric Analysis

This section justifies the selection of variables, particularly in model C as highlighted in subsection 7.3.1. Moreover, section 7.3.2 further provides a detailed interpretation of the significant variables in at least one of the three models.

7.3.1 Model Hypotheses based on the Evidence from the Literature and Context-Specific to the Study Area

The study hypothesized that the average contract price, bonus, resource provisions, quantity harvested, and Anchor Borrower program participation would positively correlate with farmers expected–observed compliance behaviour gap. This was based on the model drawn from the study's conceptual framework, which is informed by the literature and study area context summarized in the table 9 below. While payment type (not-instant), transport cost, and COVID-19 impacts will correlate negatively with farmers expected–observed compliance behaviour gap.

Table 9 Summary of some Key Findings from the Literature of Contract

Independent variable	Study	Expected relationship with expected–observed compliance gap
Average contract Price	(Ton *et al.*, 2018)	(+)
	Repar *et al.* (2018)	(+)
	Rosch and Ortega (2019).	(+)
Bonus	(Luo *et al.*, 2013)	(+)
Resource-provision	Kumar *et al.* (2013)	(+)
	(Ruml and Qaim, 2020)	(+)
Payment delay	Cai and Ma (2015)	(-)
Transport cost	Osebeyo and Aye (2014)	(-)
	Escobal and Cavero (2012)	(-)
Anchor Borrower Program	Kumar *et al.* (2013)	(+)
Covid – 19 Impact	Qi *et al* (2020b)	(-)

Source: Author's Literature Review

7.3.2 Results of Ordered Logistic Regression Models

Table 10 below presents the results of the ordered logistics regression models. Three different models (A, B, and C) were run whose dependent variables were expected, observed, and expected–observed compliance gap, respectively. Although the variables included in the models are the same, they have varying marginal effects and significance levels. In some cases, the direction of the relationships with the dependent variables also varies across the three models. The difference in the marginal effect, significance levels and direction of the relationship across models A and B may be because of the observed reality in the field, which contradicts the expectations formed by the farmers around those factors based on their effect on expected utility in ex-ante. Model C modelled the gap between the dependent variables of the two models, A (expected compliance levels) and B (observed compliance levels).

Results from model A show that about 41% of the variables included in the model were significantly correlated with the dependent variable (expected compliance). These variables are primarily household head characteristics, which is quite sensible as the transactions

happen ex-post, and they accounted for only 18% of the variation in the dependent variable. The results from model B show that about 47% of the variables included in the model were significantly correlated with the dependent variable (observed compliance). These variables comprise the transaction level and household head attributes, explaining about 78% of the variations in the dependent variable. Similarly, in model C, about 42% of the variables comprising transaction level and household head attributes were significantly correlated with the dependent variable (expected–observed compliance gap), accounting for about 29% of the variations in the dependent variable.

From model A, the results show that the variable proportion of transactions' payment delay is insignificantly positively correlated with the dependent variable (expected compliance). It has an odds ratio of 1.440, implying a 44% increase in the likelihood of being in a higher expected compliance category for a 0.01 increase in the proportion of transaction whose payments is not instantaneous. However, In model B, this variable is significantly negatively correlated with the dependent variable (observed compliance). It has an odds ratio of 0.000, which is significant at a 1% probability level, implying a 100% decrease in the probability of being in a higher category of observed compliance for every 0.01 increase in the proportion of delayed transaction payments. The positive relationship in model A may be because the farmers anticipated instant payment, and it turned out to be otherwise at the point of delivery. From model C, the variable shows a significant positive relationship with the dependent variable (expected–observed compliance gap). It has an odds ratio of 16.345, which implies about a 1500 increase in the probability of being in the category of those whose actual compliance level falls short of their expected level of self-reported compliance for every 0.01 increase in the proportion of transactions whose payment was not immediate. These findings imply that regardless of farmers' initial intention to comply, they are less likely to be in the category of those farmers that at least actualize their expected compliance in the ex-post when transaction payments are not immediate.

The variable average transport cost is insignificantly negatively correlated with the dependent variable (expected compliance) in model A. it has an odd ratio of 0.962, which implies about a 4% decrease in the probability of being in a higher expected compliance category. However, this variable is positively and significantly associated with model B's dependent variable (observed compliance) at a 1% probability level. It has an odds ratio of 1.335, which implies a

33.5% increase in the probability of being in a higher category of observed compliance for every N1000 increase in transport costs. The positive correlation in model B may be because the contract price is reasonable, and most farmers live in areas not accessible by traders. While in model C, the variable shows a significant negative correlation with the dependent variable (expected-observed compliance gap) having an odds ratio of 0.923, which is significant at a 10% probability level. This odds ratio implies an 8% decrease in the probability of being in a category of those farmers that over-report compliance for every N1000 increase in transport costs. In other words, a N1000 increase in transport cost increases the probability of a farmer being in a category of those that comply beyond their expectations.

NATPAM membership (2=non-member) shows a significant negative correlation with the dependent variable (expected compliance) in model A, and it has an odds ratio of 0.491, which is significant at a 10% level of probability, implying that the probability of being in a higher category of expected compliance decreases by 51% for non–members of NATPAM compared with the reference group. However, in model B, the variable positively correlates with the dependent variable (observed compliance), which is significant at a 10% probability level. It has an odds ratio of 2.578, implying that the likelihood of being in a higher category of observed compliance increases by 157.8% for non–members of NATPAM compared to the reference group. Moreover, in model C, the variable NATPAM membership (2=non-member) shows a significant negative correlation with the dependent variable (compliance differential) at a 10% probability level. The odds ratio of 0.598 implies that the likelihood of being in a category of those that failed to actualize their expected compliance decreases by 40% for non–NATPAM members compared to farmers in the reference group. In other words, non-members of NATPAM are more like to have low compliance differential compared to the registered members of NATPAM. These results suggest that farmers that are non-registered members of NATPAM and participated in the contract are more likely to be at a higher level of observed compliance, and more likely to perform beyond their expected compliance.

The variable Anchor Borrower Program (2=non-participant) is significantly correlated with the dependent variable in model A at a 10% probability level. The odd ratio of 0.417 for the Anchor Borrower Program (2=non-participant) in model A implies that the odds of being in a higher category of expected compliance for farmers that are non-participant in the Anchor Borrower Program (ABP) decreases by about 60% compared to farmers that are a participant

of ABP. However, this is inconsistent with the results from model B. Although the variable is not significantly correlated with the dependent variable in model B, its odds ratio of 1.001 implies that the variable anchor borrower program (2=non-participant) increases the probability of being in a higher observed compliance category for non-participant of anchor borrower program compared to the reference category. While the results from model C show that the anchor borrower program (2=non-participant) has a significant negative correlation with the dependent variable (expected–observed compliance gap) at a 10% level of probability, and it has an odds ratio of 0.469, implying that the likelihood of being in the category of farmers whose observed compliance is less their expected compliance decreases by 54% for non–participant of ABP compared to farmers in the reference group. In other words, these results indicate that participation in the ABP increases farmers' expected compliance, decreases observed compliance, and minimizes the expected-observed compliance gap.

The variable number of traders that visited farmers' farms is significantly negatively correlated with the dependent variable in model A at a 10% level of probability. The results show an odds ratio of 0.89 for this variable, which implies an 11% decrease in expected compliance for every increase in a trader that visits farmers' farms. Similarly, the results from model B indicates a significant a consistent negative correlation between the number of traders that visit farmer's farm and the observed compliance at a 5% level of probability. From model B, the variable's odds ratio is 0.813 implying a 19% decrease in the observed compliance with every increase in a trader that visits a farmer's farm. However, In model C, the variable revealed an insignificant negative relationship with the dependent variable (compliance differential). Thus, the results suggest that the number of traders that visits farmers decreases farmers expected and observed level of compliance and has insignificant effect on farmers expected-observed compliance gap.

In model A, the variable contract type (2=resource–providing contract) is significantly negatively correlated with the dependent variable (expected compliance) at a 5% level of probability. It has an odds ratio of 0.326, which implies that the odds of being in a higher level of expected compliance for farmers that are under a resource–providing contract decreases by about 68% compared to farmers that are under a non–resource–providing contract. Although the variable is not significant in model B, it gives a contrary result. In the model, the

variable has an odds ratio of 1.963 for contract type (2=Resource–providing contract) implying that the odds of being in a higher level of observed compliance for farmers under a resource–providing contract increases by about 96% compared to the reference group. Similarly, the results from model C, show a negative and significant correlation between the variable contract type (2=resource–providing contract) and the dependent variable (compliance differential) at a 5% probability level, and it has an odds ratio of zero 0.344 implying that the odds of being in a category of those whose observed compliance falls short of their expectations is about 66% lower for farmers that are under a resource–providing contract compared to the reference group. Therefore, these results suggest that farmers that are under a resource–providing contract are less likely to be in a higher expected compliance category, more likely to be in a higher category of observed compliance, and more likely to at least actualizes their expected level of compliance compared to farmers under a non–resource-providing contract.

The bonus variable (2=No bonus) is insignificant in model A. However, the odds ratio of 0.916 provides proof of a negative relationship with the dependent variable (expected compliance), which implies that farmers that have not received a bonus are more likely to have a low level of expected compliance compared to farmers that received a bonus. In contrast, the results of model B show that the probability of being in a higher level of observed compliance for farmers who have not received or promised bonuses increases by about 542% compared to those that have received it in the past. This may be because most farmers were new in the contract and had no ill-experience in dealing with the company, and they were trying to display a high commitment to get the promised bonus from the processor. While the results from model C show an insignificant positive correlation between bonus (2=no) and the expected–observed compliance gap, which implies that the probability of being in a category that fails to meet up their expected compliance level is at least about 66% higher among farmers who have not received bonus compared to the reference category.

The variable COVID-19 (2=no impact) shows a consistent negative correlation with the dependent variables in all three models. Moreover, the variable is significant at a 5% probability level in models A and C and insignificant in model B. The odds ratio of 0.243 in model A implies that the probability of being in a higher expected compliance category for farmers not affected by COVID-19 is about 76% lower compared to the reference category.

Similarly, even though the variable is insignificant in model B, the odds ratio of 0.287 implies that the probability of being in a higher category of observed compliance for farmers not affected by COVID-19 is about 71% lower compared to the farmers in the reference category. Again, the odds ratio of 0.342 in model C implies that the probability of being in a category of farmers whose observed compliance is less than their expected level of compliance is about 66% lower for farmers not affected by COVID-19 compared to the reference category. In other words, COVID-19 widens farmers' expected-observed compliance gap. Thus, farmers not affected by COVID-19 are less likely to be in the higher category of observed and expected compliance; however, they are less likely to be in the category of those that fail to actualize their expected level of compliance at least.

Table 10 Results of Factors Influencing Farmers' Expected and Observed Compliance and the Compliance Differential

Variables	Model A (Expected Compliance)		Model B (Observed Compliance)		Model C (Expected – Observed Gap)	
	Odds Ratio	SE	Odds Ratio	SE	Odds Ratio	SE
(a) Proportion of Transactions' Payment Delayed	1.440	0.842	0.000***	0.000	16.356***	9.427
(b) Transaction Attributes						
i. Proportion of Hybrid Variety Transacted	0.652	0.217	0.326**	0.146	0.645	0.219
ii. Quantity Harvested (in 1000Kg)						
(2) Moderate Quantity	0.918	0.570	2.618	1.757	0.781	0.437
(3) High Quantity	1.763	1.911	0.008***	0.012	2.156	1.701
iii. Average Contract Price (Naira/Kg)	1.002	0.013	0.965	0.024	0.999	0.012
(c) Average Transport Cost (in N1000)	0.962	0.053	1.335***	0.095	0.923*	0.044
(d) Percent Peak period Transaction	0.416	0.454	1.638	3.517	0.330	0.373
(e) Farmer Characteristics						
i. Education Level						
(2) Junior School	3.401*	1.901	2.999	2.402	2.138	1.052
(3) Senior School	4.864**	2.347	11.289**	9.823	2.361	1.046
(4) Tertiary	1.383	0.515	8.343**	5.672	1.082	0.418
ii. NATPAM (2=Non-Member)	0.491*	0.160	2.578*	0.991	0.598	0.179
iii. Anchor Borrower Program (2=No)	0.417*	0.145	1.001	0.550	0.469*	0.166
iv. Household Size (person)	0.984	0.019	0.983	0.027	0.986	0.018
v. Land Size (in Hectare)	1.078	0.075	1.160*	0.095	1.062	0.062
vi. Wealth Index						
(2) 50th Percentile	1.771	0.667	2.380	1.372	1.651	0.612
(3) 75th Percentile	2.223*	0.872	2.096	1.043	1.998	0.746
vii. Years of Contract Experience	1.128	0.150	1.227	0.185	1.067	0.129
viii. Traders that Visit Farmers previously (Person)	0.890*	0.052	0.813**	0.061	0.938	0.053
(g) Bonus Received (2=No)	0.916	0.399	6.429*	5.472	1.040	0.381
(h) Contract Provision (2=Yes)	0.326**	0.112	1.963	0.981	0.344**	0.117
(I) Covid Impact (2=No)	0.243***	0.094	0.287	0.213	0.341**	0.131
cut1	0.132	0.170	0.000***	0.000	0.167	0.199
cut2	0.219	0.279	5.009	6.513	1.134	1.332
N	262		262		262	
pseudo R^2	0.180		0.781		0.226	

Source: Author's Survey 2022

*, **, *** =10%, 5%, and 1% probability

7.4 Discussion

Relying on the previous literature and the context, the study proposed and empirically examined the factors that may influence household head expected and observed compliance behaviour and the effect of these factors on the household expected–observed compliance behaviour gap. The results of the ordered logistic regression across the three models provide evidence supporting the proposed model. The main aim of this chapter was to identify those factors that minimize or widen the compliance differential. Thus, the discussion focused on the determinants of the expected–observed compliance behaviour gap.

The sensitivity of farmers to extra costs after harvest and its effect in influencing marketing decisions is documented (Escobal and Cavero, 2012) and (Osebeyo and Aye, 2014). Irrespective of the farmers' intention to comply with the contract, rationality may make a farmer change his intention and opt for the market that minimizes his transfer costs. For instance, Alene *et al.* (2008) and Key *et al.*(2000) found that farmers' choice of where to sell is negatively affected by transport costs. Moreover, farmers' intended commitment towards contracts may be affected by the unanticipated increase in the cost of transportation due to a hike in fuel price, which may be likely in the study area. However, the evidence from this study showed a negative association between average transport cost and the expected–observed compliance, implying that a N1,000 increase in the average transportation cost made farmers more likely to comply with the contract at a higher level than they expected. This evidence may conceivably be true as the focus group data revealed that transport cost was the least important driver for compliance as farmers will aways want to sell to where the price is high. The contract price was always higher than the local market price especially during the peak season, and most of the farmers lived in a remote area far away from the company and not accessible to traders. Moreover, the contract covers transport costs particularly for farmers contracted under ABP, which constituted most of the participating farmers. Thus, most farmers would rather comply and supply to the company than take a risk of selling to local market or transporting tomatoes to markets where they were responsible for the transport costs.

Various studies, such as Qian *et al.* (2016) and Wang *et al.* (2021), have shown that a bonus is a common informal contract enforcement tool widely applied in most developing economies

to incentivize compliance. The bonus often provides a positive result. For instance, Luo *et al.* (2013) found that rebate provisions influence farmers' contractual compliance rate. Similarly, Kumar (2013) found that the performance of a farmer in a contract is positively associated with the bonus provision. Although the study found that the variable bonus had no significant correlation with the farmers' expected–observed compliance gap; however, its odds ratio that is higher than one implied that the bonus makes a farmer more likely to realize at least their expected level of compliance, which is consistent with the previous findings. Thus, it is plausible that farmers who received bonuses will at least have a similar commitment toward the contract in the ex–post. The bonus provision increased the benefit of contract compliance, raising the cost of breaking the contract. Thus, informed by the expected benefit, most farmers in the study area will try to realize at least their expected compliance in the ex–post to justify why they should be given a bonus.

Moreover, production contracts are of the type typically practised in most developing economies, which provide farmers access to inputs and services that would otherwise be unavailable (Cai and Ma, 2015). These provisions motivate some farmers to have a higher contract compliance rate to establish a reputation that will guarantee them a contract offer (Kumar *et al.*, 2013) and (Ruml and Qaim, 2020). The evidence from this study revealed that resource provision wass negatively correlated with the expected–observed compliance gap, implying that farmers under resource–providing contract arrangements complied with the contract beyond their level of expected compliance. Therefore, the study argues that production contract arrangements influence the resource–poor farmer's positive attitude towards contract and may try to actualize their intended compliance in the ex–post to continue to access the resources, which is not tenable without a contract. This input provision provides resource–poor farmers constrained by private input an opportunity to access a higher paid market.

Furthermore, it is a common practice in some developing economies to provide subsidies to smallholder farmers as part of the efforts to restrengthen the competitiveness of the value chain (Kumar *et al.*, 2013). This effort may minimize opportunism among farmers that participated and benefitted from the program. For example, in the current study, a significant number of farmers participated in the Anchor Borrower Program introduced by the Federal Government of Nigeria with the sole aim of connecting smallholder farmers to the agro-

processing market, providing them with subsidized inputs, such as hybrids seeds and fertilizer through the contracting agribusiness firms, and transport costs coverage. Despite the benefits associated with the program, evidence from this study shows that participation in the Anchor Borrower Program widened the expected–observed compliance gap. Thus, the study argues that farmers who are non-participants of the program are more likely to comply with the contract beyond their expected level of compliance. This claim may be supported by the quote below from the manager of the processing company, who revealed that most of the farmers contracted under the program are not real farmers; they engage themselves in the contract because they want to access resources coming from the government, which they deliberately perceived as their free share from the government:

"Mostly when farmers use their input, they tend to do better in the contract."

Nevertheless, the evidence from this study shows a positive relationship between the expected–observed compliance gap and the transactions' payment delay, implying an increase in expected–observed compliance for every 0.01 increase in the proportion of transactions' payments delayed by the processor for a given harvest season. Therefore, it can be argued that delayed payment makes tomato farmers change their minds in the ex–post to opt for other market options and comply less than they intended. This is because farmers under severe financial pressure will find it easier to break contracts and sell their tomatoes to the alternative markets whose transactions are based on cash and carry, even if the price in the parallel market is lower than the contract price to avoid capital tie-up, as revealed by the focus group data. Farmers producing on credits opt for markets with timely payment (Cungu *et al.*, 2008). This is the main reason why farmers in this study farmers found it easier to sell to traders that came to their farms looking for tomatoes to buy, which is closely related to Blandon *et al.* (2010), who found that farmers, in most cases, prefer transacting in a market whose characteristics resemble that of a traditional spot market where the transaction is based on cash and carry basis.

In addition to the preceding, the emergence of the COVID-19 pandemic has negatively impacted business performance globally. This is because the lockdown introduced by the government during the pandemic restricted the movement of most traders from the various parts of the countries largely responsible for the movement of tomatoes. That is from the major production areas to major consumption areas in the southern part of the country.

Moreover, most markets were closed, and people avoided crowds for health and safety reasons. As Carrington *et al.* (2014) highlighted, events like the COVID-19 pandemic causes discord between what people do and what they expect to do. For example, Qi *et al.* (2020) explored the role of COVID-19 and other factors on green food purchase intentions and the intention–behaviour gap. They found that the COVID-19 crisis widened the intention–behaviour gap. These findings are consistent with this study, as evidence showed that the COVID-19 a negative effect on farmers' expected–observed compliance gap. Thus, farmers affected by COVID-19 pandemic were less likely to comply with the contract in the ex- post beyond their expections because of the lockdown measures that affect the availability of mobility and the panic that forces most farmers to sell their produce to any available buyers regardless of the price.

7.5 Conclusion

This chapter used ordered logistic regression to examine the determinants of farmers' compliance behaviour ex–ante and ex–post and the drivers of expected–observed compliance behaviour gap. The main objective of this chapter was to examine the determinants of expected–observed compliance behaviour gap among the contracted farmers. Based on the evidence found, the study concludes that, bonus, resource provision, and transport cost minimized farmers expected–observed compliance behaviour gap. While delayed transactions payment, Anchor Borrower Program and COVID-19 widened farmers expected–observed compliance behaviour gap. These findings suggest that while maintaining the contractual attributes, policies that aim to enhance the contract should focus on resource provision and agribusinesses should adopt timely payment plans.

8 Summary, Conclusion and Recommendations

8.1 Introduction

The overarching objective of this study is to enhance contract performance at the farmer–processor interaction. Several studies have been conducted in the literature on contract farming (CF) in developing countries. Most of these studies, as previously discussed in the literature review, focus on the effect of CF on farmers' welfare, production efficiency, and income stability, with little attention paid to the effect of farmers' behaviour toward CF on contracting agribusiness firms' performance. Therefore, this study focused on the farmers' behaviour toward CF participation and compliance, which are critical performance determinants for contracting agro-processing firms. Section 8.2 summarizes the methods used and the answers to each research question based on the study's methods. Recommendations and policy implications are discussed in Section 8.3. Section 8.4 highlights some of the research limitations. While section 8.5 Highlights some of the areas for further research.

8.2 Summary

The study used mixed research methods based on a case study of the Dangote Tomato Processing Plant (DTPP) to achieve the overarching objective. It used qualitative methods (in-depth interviews and focus group discussions) to answer research question one: "How do tomato farmers choose between processor and trader contracts?" A binary logistic regression model and qualitative data was used to answer research question two: "What drives contract compliance behaviour at the farmer–processor interaction?" An ordered logistic regression model was used to answer research question three: "What are the factors influencing expected–observed compliance behaviour gap among farmers contracted by the processor?"

For qualitative data collection, in-depth interviews were conducted with the manager of DTPP and three traders identified by snowballing techniques. In contrast, four focus group discussions were conducted with farmers, one in each of the four catchment areas of DTPP that were randomly selected. Ten farmers were recruited for focus group discussions. Farmers recruited for the focus groups comprised contracts, non-contract farmers, and farmers who started and withdrew along the way. However, for the econometric tools, a

survey questionnaire was used to collect novel transaction-level data from the 300 randomly selected contract farmers every time they made a sale throughout the 2021 dry season harvest period, covering over 1306 transactions.

The qualitative exploration data showed that, unlike trader contracts, processing market contracts were either wittingly or verbally agreed upon prior to harvesting, and the terms of exchange were made explicit. It further revealed that market intermediaries played a critical role in shaping the transaction in both trader and processing market. Moreover, the cost of market entry, delivery delay, perceived uncertainties over the company's prospect, and payment arrangements were believed to be the critical factors driving farmers away from participating in the processing market contracts. While government programs, specifically the Anchor Borrower Program, resource provisions, and guaranteed prices, were believed to be the key factors that attracted farmers to contract with the processing market.

Moreover, the results of the logistic regression provide evidence that tomato farmers' contract compliance behaviour was significantly positively associated with quantity harvested, transport cost, education level, and resource provisions. In contrast, open fresh market price, non-instant payment, and wealth index negatively correlated with farmers' contract compliance behaviour. The results imply that the probability of a contract farmer complying with the contract in every transaction increased with an increase in quantity harvested, transport cost, education level, and input provision and decreased with an increase in open fresh market price, non-instant payment, and wealth index.

Furthermore, the ordered logistic regression results established that resource provisions and bonuses were significantly positively correlated with the farmers expected–observed compliance behaviour gap. In contrast, the proportion of transaction payments delayed, Anchor Borrower Program, and the COVID-19 pandemic are significantly negatively associated with farmers expected–observed compliance behaviour gap. These results indicate that resource provisions and bonuses minimized farmers expected-observed compliance gap. At the same time, an increase in the proportion of transaction payment delayed and COVID-19 pandemic widened farmers expected-observed compliance gap.

8.3 Recommendation/ Policy Implication

Based on the above findings, the study highlights the following recommendations and policy considerations that may be useful to contracting agribusiness firms, farmers and policymakers:

- The contracting agro-processing firm should have an organized schedule for harvest collection to minimize the time farmers spend at the collection centre during harvest delivery. This schedule can be developed by grouping farmers based on production clusters or their local government areas (LGAs) and organizing harvest collection accordingly. The daily minimum processing requirements should determine the number of clusters or LGs to be covered per day. Moreover, the schedule should provide an allowance between collections to accommodate unforeseen challenges that may arise due to technology failure. This action could eliminate overcrowding at the delivery centre and prevent farmers from incurring extra costs due to unplanned waiting and subsequent harvest losses.
- The contracting agro-processing firm should adopt effective payment settlement plans that ensure payment within the agreed timeframe to minimize contractual breaches resulting from payment delays. The contracting firm can merge harvest delivery screening and payment screening concurrently. Moreover, digital payment should be adopted to fast-track payment. Farmers' accounts should be credited immediately after the harvests are collected, screened, and cleared, or a cheque could be issued to farmers without accounts. These farmers can tender the cheques to the designated bank to convert them to cash. This would increase farmers' confidence and reliability in the contracting firm and prevent farmers with pressing financial needs from selling outside the contract.
- The contracting firm should introduce incentives into their contract design to attract more farmers and minimize the temptations created by the open market price for farmers already in the contract scheme. The firm should consider promising a bonus or special opportunity to farmers with a specified level of performance in the contract to encourage good behaviour. At the same time, the firm should consider crediting a threat of contract termination or individual penalty should the farmers breach the contract agreement to discourage bad outcomes among farmers who intend to breach

the contract. Rational tomato farmers will want to participate in an assured market with a reasonable price and bonus.

- Policies that aim to enhance contracts will do better if more attention is paid to providing improved seeds, extension, and other services critical to the agro-processing market. Providing resources and extension services to farmers will allow the willing farmers impeded by private input provision to participate in the contract. At the same time, a sizeable number of farmers participating in the CF scheme through government-assisted programs may try hard to comply with the contract to enforce the opportunity of securing a contract in the future.
- The existing Anchor Borrower Program introduced by the government to link farmers with the processors through the association's leadership may do better if consequences are presented on defaulting farmers. The association's leadership that provides guarantor to farmers should be held responsible for deviant farmers. Most farmers use the association platform to access the processor's resources then default. Therefore, having the association leadership accountable for farmers' breach of contract will force them to monitor and supervise the farmers to ensure they comply. Furthermore, this action will strengthen the association’s membership scrutiny, and subsequently deny membership to those with a history of breaking agreements or whose behaviour is unreliable.
- Government should provide water supply infrastructure along the irrigation channels to enhance contract participation and compliance among farmers. Many farmers are influenced by huge investment in water pumping machine and fuelling, which barred them from contract and influence the contracted farmers to sell outside the contract to oppress the transaction costs incurred. Therefore, installing water pump machines that will provide easy water access to farmers farms may attract more farmers into the contract and minimize contractual breach.
- Farmers constrained by resources from partaking in processor's contract markets may do better if they adopt cooperative or group production and enter into a contract as a group rather than individuals. Therefore, farmers can organize themselves in groups and adopt an agreement that explicitly states the shared capital investment, profit, and risk sharing. Farmers in these groups or cooperative production may do better because of the shared responsibility of achieving the larger group's interest.

8.4 Limitations

The outcomes of this study are not without limitations that need to be considered. The generalizability of the findings is subject to the following three limitations observed during the study.

Firstly, the findings are based on a case study of Dangote Tomato Processing Company, the largest and only existing functional tomato processing plant in Nigeria at the time of the study. Although the findings could be applied to other contracting processing and agribusiness firms, the findings may reflect something other than the reality of other processing companies or other countries. Therefore, further research is needed to reinforce these findings.

Secondly, there are two tomato production cycles in the study area in a year. The two production cycles are the rainy and dry seasons. The study relies on transaction–level data collected only during the 2021 dry season production period, which is the major tomato production season. However, the dynamics of farmers' attitudes towards contract participation and compliance may not be the same during the rainy season due to an array of activities in which farmers often partake. Although some farmers may not produce in both seasons, the dynamics may change at the household level across seasons. Therefore, this provides an opportunity for future research.

Thirdly, the study identifies some critical factors such as incentives, quantity harvested, transport cost, education level, and input provision that enforces contract compliance among farmers. However, the study is unsure whether the compliance is due to these factors or the cognitive trust between farmers and the contracting processing firm that evolves through repeated interaction. Therefore, it could be better if future research on contract compliance explores more regarding the role of trust in farmers' contract compliance behaviour.

Fourthly, the study has established that open market price is among the most critical drivers of contractual breach. However, the size of the price differential or rent created by the open market is variable, and the study cannot explain whether there is a particular level that the price differential must attain before a farmer chooses to break the contract. Therefore, this highlighted a future research opportunity.

8.5 Further Research

Further research is needed to explore farmers' contract compliance behaviour across processing firms to enforce the findings of this study. Moreover, future research on tomato contract compliance behaviour should focus on farmers' contract compliance behaviour during the rainy season to understand the dynamics across seasons. In addition, the role of trust in farmers' contract compliance behaviour should be another new area for future research to explore, as literature has shown that trust minimizes transaction costs. Furthermore, future research needs to determine the effect of price differential levels on contract compliance behaviour to understand the compliance dynamics better among farmers.

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Appendix I: Ethical clearance for Survey

Form 2. MSc PhD Staff Ethical Clearance Submission Form

PLEASE allow a minimum of 3 weeks for this process.

You must not begin your research until you have obtained consent as evidenced by this form returned from the APD student Office signed and dated. Ethical Clearance cannot be granted retrospectively.

This form can only be used if the application :

- Does not involve participants who are patients or clients of the health or social services
- Does not involve participants whose capacity to give free and informed consent may be impaired within the meaning of the Mental Capacity Act 2005
- Does not involve patients who are 'vulnerable'
- Does not involve any element of risk to the researchers or participants
- Does not involve any participants who have a special relationship to the researchers/investigators

If any of the above apply, please refer to the APD Ethics Chair to decide whether an application can be made through the APD review process or whether the application needs to be referred to the full University Committee.

It is the applicant's responsibility to check for any particular requirements of a funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

Full details of the University Research Ethics procedures are available at http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REethicshomepage.aspx and you are encouraged to access these pages for a fuller understanding. Some helpful advice is available on this link http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REwhatdoIneedtodo.aspx and the FAQs are particularly relevant.

ALL QUESTIONS MUST BE COMPLETED.

APD Ethical Clearance Application Reference Number : Click here to enter text.

1. APPLICANT DETAILS:

Main applicant name:	Umar Shehu Umar
Name of academic supervisor/project investigator:	Prof. Elizabeth Robinson
Email Address (decision will be emailed here): u.umar@pgr.reading.ac.uk	
MSc Student	☐
PhD Student	☒
Staff Member	☐
Other (please specify)	Click here to enter text.

2. PROJECT DETAILS:

Title of project: Contracts and the Problem of Low Contract Compliance in Nigeria's Tomato Markets.

Please provide a lay summary of the project, including what is being investigated and why:

Contract is being postulated to improves the performance of the agricultural market (Elder, 2019; Olomola, 2010). Agro-processors in Nigeria engage farmers into a contract at a fair price, but based on anecdotal evidence the contracts between agro-processors and farmers seems to be easily broken. This greatly affect the processor's performance in the local market which contradict the postulation made by so many reserachers that establishing processing plants will strengthen the competitiveness of tomato sector.

some studies concluded that the problem of low contract compliance is do to weak enforcement mechanism that make contractual breach easy. Contracts in sub-sahara Africa are verbal, most farmers are smallholder, low volume transaction and a cost of legal action is hugely costly and cannot be easily justified. Thus, the use of informal enforcement mechanisms such bonus and penalty or price premium is found to be relatively efficient by some studies. some other studies also link the problem of low contract compliance to farmer's social capital such as trust and reputation while other link it to the problem of contract design attributes. However, It is not clear to what extent this is due to presence of parallel market, contract design attributes or farmers' social capital.

In Nigeria, Tomato sector is one of the most critical sector that remain an essential

livelihood driver to most smallholders farmers and other value chain stakeholders due to its promising profit when market conditions are favourable. Thus, the problem of excess harvest losses, income variability and price volatility among farmers could only be sorted if there is an efficient trade relationship among the value chain stakeholders.
The study, therefore, investigate what drives low contractual compliance in Nigeria's tomato markets. The overarching objective of the study is to enhance contract along tomato value chain, focusing mainly on contracts between tomato farmers and agro-processors.

Procedure. Please outline the project's research protocol (what procedures, research methods and analysis methods are being used) :
Research methods
The research uses mixed method, the focus groups and interviews help our understanding of the story, processes and the nuance. The quantitative will provide explanation about the relationships between some factors and contractual compliance. It will as well provide an explanation as to why the market players (processors, farmers and traders) do what.
Data collection
1. The list of farmers will be collected from the farmer's association register. Fifty (50) farmers will be selected randomly from the association's register in each of the four selected Local Government Areas of study.
2. Six (6) enumerators that can read, write and preferably those that are conversant with data collection methods would be employed. one (1) enumerator would be chosen from each of the four (4) selected areas of study and the other two (2) would be chosen based on convenience to move around the four (4) selected locations with the researcher. The role of enumerators are;
a. help the farmers with the translation and recording of observation on the questionnaires as majority of them will not be able to read and write.
b. monitor farmers harvest by keeping close contact on a weekly basis to record transaction information each time a farmer made sells.
3. Meet with the enumerators, brief and train them on how to collect both the transaction level and cross sectional data. The enumerators chosen from each of the locations will be issued with the list of selected farmers including their phone numbers and be paid £15 (half of the total amount to receive for the exercise) as a start-up amount.
4. Meet with the farmers together with the enumerators to administer the survey questionnaires in each of the selected location before harvest starts. The information to be collected using the structured questionnaire include; socio-economic and demography, social capital, transaction costs, contract design attributes, and contract compliance.
5. Arrange for the of collection of transaction level data in each of the visited location immediately after administering the questionnaires by attaching farmers

with the enumerator assigned to collect information from them. Farmers that agrees to participate in the survey will receive a cash payment equivalent of £2 immdiately after filling the survey questionnaire and £1 equivalent of phone credit at least twice at an interval if he agree to participate in the follow up survey to collect the transaction level data : what they sold, when, to who, price, and how much. The enumerators are to make sure that every week a farmer update them with the information.

6. Where face to face contact is not possible due to COVID-19 phone call interview will be used and responses from each farmer will be recorded on the questionnaire. Where this is applicable, each enumerator will receive a phone credit of at least £2 or more depending on the number of farmers he is going to interview. And each enumerator will receive a phone credit of £1.

Data Analysis

-Ordinal Logit model would be used to analyzse the cross sectional data using gretl.

-The transaction level data collected would be used to calibrate a game-theory model.

Period over which the data collection is to be undertaken (note: data collection CANNOT commence until ethical approval has been granted as evidenced by this form signed and returned).

Proposed Start Date: 08/02/2021

Proposed End Date: 30/04/2021

3. THE RESEARCH:

a) Nature and number of participants who are expected to take part in your survey/focus group. Please estimate if uncertain. As ethical clearance involving minors is more complex because of safeguarding and consent issues, please consider carefully whether you need to involve minors under the age of 16 in your research.

Participants	Number participating
Minors under 16 years of age	NA
Students	NA
Other members of the University	NA
Members of the general public	306

Businesses

Government officials NA

Other *If other please specify:* *NA*

b) Funding. Is the research supported by funding from a research council or other external sources for example a charity or business?

Yes ☒ If yes, please specify funder : COMMONWEALTH SCHOLARSHIP COMMISSION

No ☐

If yes, it is the responsibility of the applicant to check for any particular requirements of the funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

c) Recruitment. Please describe recruitment procedures. How have participants been selected? Are there any inclusion/exclusion criteria? Participants must be told on the Participant Information Sheet how and why they have been selected. You should attach ay recruitment materials to this application. Following the qualitative data, a quantitative data would be collected from 300 farmers that would be drawn from the least of registered farmers that engaged into contract with Dangote processing company. The sample size selection is based on convenience and Dangote processing plant will be selected being the largest functional processing plant in Nigeria that dealt with more than 10,000 farmers on a supply contract (Kutawa, 2016).
The first stage is purposive selection of two Local Government Areas namely; Kura and Garun Mallam, Bunkure and Dambatta being among the major catchment areas of the processing company. Kura and Garun Mallam are selected because of their close proximity to the processing plants and are located along the road that connect major cities around. Thus, they are the most accessible areas to itinerants traders. While Bunkure and Dambatta are selected because they are located in a very remote area far away from the processing plants and the main road that connect to major cities.
The second stage is the purposive selection of Five production clusters based on the intensity of tomato production. And the third stage would be random selection of 15 farmers from each of the selected cluster to cover the sample size of 300

d) Exceptions. Does the research involve minors, medical patients, individuals with learning difficulties, vulnerable adults, participants recruited through social service departments, or anyone in a special relationship with yourself/data collectors? E.g. Supervisor; lecturer to a group of students; or person in a position of responsibility for participants.

Yes ☐

No ☒

If yes, this may result in referral to the University Research Ethics Committee (please note their deadlines). Please provide extra detail here: Click here to enter text.

e) Where is the data collection to be undertaken? Specify country(ies) and specific location(s) The Data collection covers four (4) Local Government areas of Kano State, Nigeria namely; Kura, Garun Mallam, Bunkure and Dambatta .

f) What forms of data collection does the research involve?

Group discussion/ workshop ☐

Personal interviews ☐

Telephone interviews ☐

Questionnaire/paper survey ☒

Postal survey ☐

Email/ online survey ☐

Which software tool will be used, if any? Click here to enter text.

Other *(specify)*: Click here to enter text.

g) Who will undertake the collection and/or analysis of data?

Myself ☒

Other MSc students ☐

Other Higher degree students ☐

Other contract research and/or academic staff ☐

Individuals outside University ☒

External organisations ☐

If individuals outside the University and/or external organisations are involved in the collection or analysis of data, give brief details below. Indicate how the ethical procedures and standards of the University will be satisfied: The enumerators employed in this survey will not keep any information collected from the survey. All

information collected manually will be handed over to the research immediately and information collected via mobile phones including the farmers mobile contacts would be deleted immediately at the end of the survey and access will be restricted to only me and my supervisor.

h) Does the research require participants to consume any food products?

No ☒

Yes ☐

If yes, please provide full details and indicate measures in place to ensure excellent food hygiene standards and ensure participant safety. Click here to enter text.

i) Do you consider there are any potential ethical issues in this project? Does the research require collection of information that might be considered sensitive in terms of confidentiality, potential to cause personal upset, etc.?

No ☒

Yes ☐

If yes, please provide full details and indicate how these issues will be addressed, how researchers will manage participant reaction. Support and de-brief sheets should be attached if relevant. Click here to enter text.

j) Will the research involve any element of intentional deception at any stage? (i.e. providing false or misleading information about the study, or omitting information)?

No ☒

Yes ☐

If yes, this must be justified here. You should also consider including debriefing materials for participants which outline the nature and justification of the deception used. Click here to enter text.

k) Are participants offered a guarantee of anonymity and/or that the information they supply will remain confidential?

Yes ☒

No ☐

If yes, give brief details of the procedures to be used to ensure this and particularly if the data has 'linked' or 'keyed' anonymity (eg. where published results are anonymous but participant details are recorded and held separately to the responses but keyed with reference number) : The participants name and contact details will not be captured on the questionare, only anonymous identifier would be used to link his contact with his original responses by means of a keyed spreadsheet. This spreadsheet and contact details will be password protected and the password known only to me and my supervisor, and will not be shared with any third parties. The spreedsheet will be kept on my password protected PC and will be destroyed at the end of my degree.

l) Will participants be required to complete a separate consent form? Many APD applications do not require participants to complete a separate consent form. Please see the templates provided.

☐ Yes. Names, addresses and copies of completed forms will be given to APD student office

☒ No. The data collection is anonymous and a combined information/consent sheet supplied

☐ Neither of the above, or the research involves participants under the age of 16

If 'neither of the above' selected, or the research involves participants under the age of 16, please outline the specific circumstances. Click here to enter text.

m) Will participants be offered any form of incentive for undertaking the research?

No ☐

Yes ☒

If yes, give brief details, including what will happen to the incentive should the participant later withdraw their input or decide not to proceed : Farmers that participate in the survey will receive a payment equivalent of £1 wraped in the envelope with no name written during administering of survey questionnaires as a motivation and he will receive a phone credit of £1 weekly. The enumerators employed will receive £15 at the beginning of the survey and £15 at the end of the survey. None of the farmer would be asked to return back the incentive if they later decide to withdraw their consent during or after the survey. Should any of the enumerator decided to withraw from the survey he will only receive a payment equivalent to the number of days he worked based on the expected number of days to be spent in doing the survey (8 weeks). Moreover, it is important for me to be

flexible in the field and to be able to use my judgement as to whether or not a farmer and/or enumerator gets a payment.

4. DATA PROTECTION

Data Storage, data protection and confidentiality. Please make sure you are familiar with the University of Reading's guidelines for data protection and information security. http://www.reading.ac.uk/internal/imps/

Please outline plans for the handling of data to ensure data protection and confidentiality. Covering the following issues: Will any personal information be stored? How and where will the data be stored? Who will have access to the data? When will it be deleted?

Personal data of the participants and any information from participants that is collected will be stored on a password-protected hard drive up until the completion of the research, and will be destroyed after finishing the research final report. The data collected will be accessible by only me and my supervisor. There will be no personal information of the participants that would be revealed in the final report

Applicants: Please now scroll to Section 7 to input your :

- Information Sheet(s) for Participants (mandatory)
- Data Collection Tools, for example: recruitment materials, interview/focus group protocols (how you are conducting the process), interview/focus group questions, questionnaires, online survey questions, debriefing and fact sheets
- Consent Forms (optional, may not be necessary if consent assumed in Information Sheet)

If the text boxes do not allow input in the desired format, please append documents separately to the email when sending this form.

Please then email your completed form (and any separate supporting documents) to your supervisor/project investigator. Project investigators or independent academics may return form directly to sapdethics@reading.ac.uk

A decision on whether ethical clearance has been granted will be emailed to you via the APD Student Office along with your authorised form.

You may NOT proceed with your data collection until ethical approval has been granted as evidenced by return of this approved form.

Note: The process of obtaining ethical approval does not include an assessment of the scientific merit of the questionnaire. That is the separate responsibility of your supervisor/project investigator in discussion with yourself.

5. Supervisor/project investigator review. Section to be completed by supervisor/PI where relevant.

Participant information sheet(s), data collection tools and any other supporting information may be pasted in section 7 below. Alternatively they may be attached to this email. Please review these documents and then complete the checklist below.

Checklist. Does this application and supporting documents adequately address the following ?

☐ The safety of the researcher(s) and those collecting data, the safety of the participant(s)

☐ Is the language /grammar/content appropriate (i.e. University standards and reputation upheld)

☐ There are no questions that might reasonably be considered impertinent or likely to cause distress to the participants

☐ The researcher has provided the participant information sheet (mandatory)

☐ The researcher has provided the questionnaire or survey/ workshop, focus group or interview questions (mandatory)

☐ The Participant Information Sheet gives sufficient information for the participants to give their INFORMED consent

☐ A separate consent form has been included (optional)

☐ Data will be handled, stored and deleted appropriately according to University guidelines, and the participants have been adequately informed about this in the Participant Information Sheet

☐ The Participant Information Sheet contains all relevant sections

☐ I am satisfied that this application meets the minimum standards for APD Ethical Clearance to be granted

Supervisor/Project Investigator, please forward this form as a WORD document and any separate supporting documents to sapdethics@reading.ac.uk. The form will be logged by the student office and allocated to an APD ethics committee reviewer. The APD ethics reviewer will review the application and complete section 6.

6. APD ethics committee review. Section to be completed by APD Ethics Committee member.

Decision

Clearance refused ☐ Resubmission required

Clearance granted as presented ☐

Clearance granted subject to revisions suggested ☐ No need to resubmit once amended

Referred to APD Research Ethics Chair ☐ May require further information

Ethics Committee Member please enter comments, reasons for rejection, summary of revisions required before proceeding (if applicable):

Click here to enter text.

Committee Member Name: Click here to enter text. Date Reviewed : Click here to enter a date.

APD Ethics Committee member electronic signature (For signature, save document as pdf, then open pdf and use 'sign' option. Alternatively check here if no electronic signature used ☐)

APD Ethics Committee Member : Now please email this completed form (as signed pdf) to sapdethics@reading.ac.uk together with any separate supporting documents . The student office will record the outcome and return the completed form to the applicant with the decision.

7. Supporting Documents.

Please cut and paste the following documents into the text boxes below.

- Participant Information Sheet(s),
- Protocols (the procedures, how you will conduct and administer the data collection, interviews, surveys)
- Data Collection Instruments (interview questions and survey questions)
- Consent Forms (if Participant Information Sheet does not assume consent)
- Recruitment Materials (if relevant)

It is preferable that all information connected to this application is contained in one document. However, if you find that the text boxes below are not adequate, you may attach and email these supporting documents separately.

Supporting Documents for this application are pasted below. The text boxes cannot accept some types of formatting when pasting in documents. If this is the case, append them separately to the email with this form.

Participant Information Sheet

I am a PhD student at the University of Reading in the UK. I am conducting research into tomato value chain as part of requirement for the award of my doctoral degree.

This research project aims to explore how farmers and processors interact. .

As part this research, I am are currently contacting farmers that engaged into contract with agro-processors to find out more about this interaction

Umar Shehu Umar

Student Contact Details

School of Agriculture, Policy and Development

Agriculture Building

Earley Gate, Whiteknights Road

PO Box 237

Reading RG6 6AR

United Kingdom

E-Mail: u.umar@pgr.reading.ac.uk

Mobile Phone:

Supervisor Contact Details

Name: Prof. Elizabeth Robinson

E-Mail: e.j.robinson@reading.ac.uk

Survey Questionnaire

Section A: Social Capital

1. (ai) How many traders visited your farm last year……..?
   (aii) How many transactions did you made with the traders last year?
   (1) one (2) two (3) three (4) other (specify)…….
   (bi) Are you a member of any of the association specified in the table below?
   (1) Yes (2) No
   (bii) if yes, please tick any that apply to you

1	Farmer group or cooperative	
2	NGO or civic group	
3	village committee	
4	A religious or spiritual group	
5	Finance, credit, or savings group	
6	Don't Know or Don't Remember	
7	Prefer not to Say	
8	I am not a member of any of the above	

   (c) What is the main benefit of joining any group in (12) above?
   1) Improves my access to services 2) Important in times of emergency/in future 3) Benefits the community 4) Spiritual, social status, self-esteem (5) Doesn't know (6) Do not want to answer (7) Other……

Section B: Contract Design Attributes

2. (a)what type of price fixing mechanism is agreed with processor last year?

(1) Flexible pricing with processor at harvest(2) Fixed price with processor at planting (3) Other(specify)…….

(b)if any of the above, can you tell us how satisfied are you with that ?

(1) Satisfied (2) somewhat satisfied (3) Indecisive (4) somewhat dissatisfied (5) dissatisfied

(c) If 4 or 5, choose any of the following reason that applies to you

1. do not favour me when the fresh market price is high
2. do not take into account the change in the price of production input
3. Other (specify)…….

3. (a) Which of the following payment options is agreed with the processor at the beginning of the contract?

(1) Payment in advance (2) payment at the point of delivery 3) payment few days after delivery (4) payment at most a week after delivery (5) None (6) other (specify)……..

(b) Have you experienced any payment problem with the processor after you have successfully delivered the tomatoes?

(1) Yes (2) No

(c) If yes please choose the one that applies to you

(1) delayed Payment (2) Non-payment (3) partial payment (4) others (specify)…….

(d) if (1) how long does it take you to receive your payment (in days)?.....

(e) if (2) or (3) why?.....

4. (a) Have you received a bonus or a reward from the processor last year?

(1) yes (2) No

(bi) if Yes, what ?.....

5. (a) Is there any penalty for farmers that renege with the contract?

(Yes (2) No

(b) If yes, which of the following penalty have you ever received?

(1) contract termination (2) legal action (3) others (specify)……..

Section C: Transaction Cost

6. (a) Which of the following delivery arrangement is agreed with the processor's at the beginning of the contract last year?

(1) Farmer to deliver tomatoes to company (2) company take up tomatoes at the farm (3)others (specify)…….

(bi) How far are you from the company? (Km)……

(bii) How much a farmer pays per crate to transport tomato from his farm to the company? (in Naira)……

(c) How long do you have to wait in a queue last year with your tomatoes before collection starts at the company? (in days)……..

(d) How long does it take for your tomatoes to be screened before it is accepted (hours)……

7. (a) How do you know about the fresh market price?

   (1) Through a friend (2) personal visit to market (3) neighbour (4) other (specify)……..

   (b) How much does it cost you to get information about price from any of the sources in (bi) above ? (Naira)……

Section D: Repeat Contract

8. (a) Would you say that "*I try to obey the rules in the contract because I want to get a contract next year*"? please choose any of the following that applies to you.

   (1) strongly disagree (2) disagree (3) Indecisive (4) agree (5) strongly agree

   (b) Please tell us why you chose this response.....

Section E: Contract Compliance

9. (a) Would you say that "*I strictly comply with all the terms of the contract*"?

   (1) strongly disagree (2) disagree (3) Indecisive (4) agree (5) strongly agree

   (b) Please tell us why you chose this response.....

Section F:Fresh Market Price/parallel Market

10. (ai) what is the price of tomato in fresh market at the beginning of harvest season last year? .....

    (aii) what is the price of tomato in fresh market towards the mid harvest season last year?.....

    (aiii) what is the price of tomato in fresh market towards the end of harvest season last year?.....

    (aiv) what is the average price of tomato in fresh market last season?.....

    (b) How much higher is processor's price compared to the price in fresh market?(Naira).....

    (ci) Would you say that "*fresh market price will affect the quantity of tomatoes I will supply the processor* "?

    (1) strongly disagree (2) disagree (3) Indecisive (4) agree (5)strongly agree

    (cii) Please tell us why you chose this response.....

Section G: Socio-economic Characteristics

11. Age (years)…….
12. Educational status

(a) primary school or below; (b) junior middle school; (c) senior middle school or technical secondary school; (d) college or above.

13. Years of Educational attainment…….

14. Years of farming experience……
15. Household size……..
16. Farm size (Ha)……
17. What is your annual income from farming activities (Naira)……..
18. What is your annual income from off-farm activities (Naira)……..
19. Did you own any of the following means of transportation (1) bicycle (2) motorcycle (3) donkey (4) lorry (5) none (6) others (specify)…….
20. Do you have any access to credit or financial support (1) yes (2) No
21. What is your source of credit?
    (1) Family (2) friends (3) credit or saving group (4) lending institute (5) others (specify)……..

Transaction Level Data

Quantity of Tomatoes Harvested (in crates)

Harvest	Date	Total Quantity harvested (crates)	To whom sell is made		Price per crate (N)	Payment type		Transport paid (N)
			(a) Processor	(b) Trader		Instant	Delayed	
1st Harvest								
2nd Harvest								
3rd Harvest								
4th Harvest								
5th Harvest								
6th Harvest								

Click here to paste your supporting documents into a text box

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University of Reading

Appendix II Ethical clearance for Qualitative Methods

Internal Ethical Clearance Procedures and Submission Form

Form 2. MSc PhD Staff Ethical Clearance Submission Form

PLEASE allow a minimum of 3 weeks for this process.

You must not begin your research until you have obtained consent as evidenced by this form returned from the APD student Office signed and dated. Ethical Clearance cannot be granted retrospectively.

This form can only be used if the application :

- Does not involve participants who are patients or clients of the health or social services
- Does not involve participants whose capacity to give free and informed consent may be impaired within the meaning of the Mental Capacity Act 2005
- Does not involve patients who are 'vulnerable'
- Does not involve any element of risk to the researchers or participants
- Does not involve any participants who have a special relationship to the researchers/investigators

If any of the above apply, please refer to the APD Ethics Chair to decide whether an application can be made through the APD review process or whether the application needs to be referred to the full University Committee.

It is the applicant's responsibility to check for any particular requirements of a funder regarding ethical revie w. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

Full details of the University Research Ethics procedures are available at http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REethicshomepage.aspx and you are encouraged to access these pages for a fuller understanding. Some helpful advice is available on this link http://www.reading.ac.uk/internal/res/ResearchEthics/reas-REwhatdoIneedtodo.aspx and the FAQs are particularly relevant.

ALL QUESTIONS MUST BE COMPLETED.

APD Ethical Clearance Application Reference Number : Click here to enter text.

8. APPLICANT DETAILS:

Main applicant name: Umar Shehu Umar

Name of academic supervisor/project investigator: Prof. Elizabeth Robinson

Email Address (decision will be emailed here): u.umar@pgr.reading.ac.uk

MSc Student ☐

PhD Student ☒

Staff Member ☐

Other (please specify) Click here to enter text.

9. PROJECT DETAILS:

Title of project: Contracts and the Problem of Low Contract Compliance in Nigeria's Tomato Markets.

Please provide a lay summary of the project, including what is being investigated and why: *In Nigeria, Tomato sector is one of the most critical sector that remain an essential livelihood driver to most smallholders farmers and other value chain stakeholders due to its promising profit when market conditions are favourable. The problem of excess harvest losses, income variability and price volatility among farmers remain a major setback to this sector. Various literatures postulated processing industries to strengthen the competitiveness of tomato sector and sort these problems. Most processing industries uses contract to secure and insure raw material supply (Ugonna et al., 2015), minimize transaction costs and maximize profit (Osebeyo and Aye, 2014).*

However, observation from literature revealed that the contractual transaction between farmers and processors is low. And based on anecdotal evidence the contracts between agro-processors and farmers seem to be easily broken in the presence of a better alternative (particularly Traders that make fresh tomato available in the urban space). Thus, tomato processing industries in Nigeria is being greatly affected by farmer's poor contract participation and excess contractual breach.
Conceivably, the rate at which farmers participate and comply with the processors contract greatly determine the processor's performance. The study, therefore, investigate what drives low contract participation and excess contractual breach in Nigeria's tomato markets. The overarching objective of the study is to enhance contract along tomato value chain, focusing mainly on contracts between tomato farmers and agro-processors.

Procedure. Please outline the project's research protocol (what procedures, research methods and analysis methods are being used) : Data collection protocol.

- All participants must use face masks, hand sanitizers and maintain social distancing to ensure strict adherence to COVID 19 guidelines.
- Focus group and interviews would first be conducted to understand the story, processes and the nuance. And follow it up with questionnaire survey.
- Four (4) focus group would first be conducted one each of the selected location which will be done within a period of one week.
- 6-10 participants would be recruited into each of the focus group with the help of

community leadership.

- The focus group would be conducted in a safe and convenient place that will ensure strict adherence to COVID-19 protocol.
- All participant must read and agree to the information contain in the participant information sheet.
- All participant would be paid some token after the focus group as some of them may have to shun there other important engagements to join the focus group.
- 10 interviews would be conducted with the selected stakeholders (traders, processor's, key informants that include; farmers, government officials, market leadership) for a period of two (2) weeks.
- All interviews would be conducted at the convenience of the selected stakeholders.

Period over which the data collection is to be undertaken (note: data collection CANNOT commence until ethical approval has been granted as evidenced by this form signed and returned).

Proposed Start Date: 23/11/2020

Proposed End Date: 30/04/2021

10. THE RESEARCH:

n) Nature and number of participants who are expected to take part in your survey/focus group. Please estimate if uncertain. As ethical clearance involving minors is more complex because of safeguarding and consent issues, please consider carefully whether you need to involve minors under the age of 16 in your research.

Participants		Number participating
Minors under 16 years of age		NA
Students	NA	
Other members of the University	NA	
Members of the general public		40
Businesses		
Government officials		5
Other *If other please specify:*		*NA*

o) Funding. Is the research supported by funding from a research council or other external sources for example a charity or business?

Yes ☒ If yes, please specify funder : COMMONWEALTH SCHOLARSHIP COMMISSION

No ☐

If yes, it is the responsibility of the applicant to check for any particular requirements of the funder regarding ethical review. Some funders may require that the application is reviewed by full University Committee and not the devolved School committee.

p) Recruitment. Please describe recruitment procedures. How have participants been selected? Are there any inclusion/exclusion criteria? Participants must be told on the Participant Information Sheet how and why they have been selected. You should attach ay recruitment materials to this application.
The study will conduct four (4) different focus group discussions one in each of the selected Local Government Areas to explore different views, and dynamics that may be unique to each location as well as varying trader densities. 6-10 people people would be recruited into each of the focus group being the least requirement as in (Lupton, 2016). The selection is on the basis of farmer's conveineince and availability.
for the purpose of interview, At least three (3) traders, two (2) members from the management of Dangote processing company, one (1) leader of a Farmer association or cooperative society, one leader of a main Market, one (1) official of both Kano Agricultural and Rural Development Agency (KNARDA) and Central Bank of Nigeria, would be interviewed.
The farmers selected for the focus group will also be part of the survey that will follow this qualitative study

q) Exceptions. Does the research involve minors, medical patients, individuals with learning difficulties, vulnerable adults, participants recruited through social service departments, or anyone in a special relationship with yourself/data collectors? E.g. Supervisor; lecturer to a group of students; or person in a position of responsibility for participants.

Yes ☐

No ☒

If yes, this may result in referral to the University Research Ethics Committee (please note their deadlines). Please provide extra detail here: Click here to enter text.

r) Where is the data collection to be undertaken? Specify country(ies) and specific location(s) The study will take place in four (4) Local Government areas of Kano State, Nigeria namely; Kura, Garun Mallam, Bunkure and Dambatta .

s) What forms of data collection does the research involve?

Group discussion/ workshop	☒
Personal interviews	☒
Telephone interviews	☐
Questionnaire/paper survey	☒
Postal survey	☐

Email/ online survey ☐

Which software tool will be used, if any? Click here to enter text.

Other *(specify)*: Click here to enter text.

t) Who will undertake the collection and/or analysis of data?

Myself ☒

Other MSc students ☐

Other Higher degree students ☐

Other contract research and/or academic staff ☐

Individuals outside University ☐

External organisations ☐

If individuals outside the University and/or external organisations are involved in the collection or analysis of data, give brief details below. Indicate how the ethical procedures and standards of the University will be satisfied: Click here to enter text.

u) Does the research require participants to consume any food products?

No ☒

Yes ☐

If yes, please provide full details and indicate measures in place to ensure excellent food hygiene standards and ensure participant safety. Click here to enter text.

v) Do you consider there are any potential ethical issues in this project? Does the research require collection of information that might be considered sensitive in terms of confidentiality, potential to cause personal upset, etc.?

No ☒

Yes ☐

If yes, please provide full details and indicate how these issues will be addressed, how researchers will manage participant reaction. Support and de-brief sheets should be attached if relevant. Click here to enter text.

w) Will the research involve any element of intentional deception at any stage? (i.e. providing false or misleading information about the study, or omitting information)?

No ☒

Yes ☐

If yes, this must be justified here. You should also consider including debriefing materials for participants which outline the nature and justification of the deception used. Click here to enter text.

x) Are participants offered a guarantee of anonymity and/or that the information they supply will remain confidential?

Yes ☒

No ☐

If yes, give brief details of the procedures to be used to ensure this and particularly if the data has 'linked' or 'keyed' anonymity (eg. where published results are anonymous but participant details are recorded and held separately to the responses but keyed with reference number) : The participants name and email address will be linked to his original responses by means of a keyed spreadsheet held separately. This spreadsheet and contact details will be password protected and the password known only to me and my supervisor, and will not be shared with any third parties. The spreedsheet will be kept on my password protected PC and will be destroyed at the end of my degree. And also, all the videos and audios recorded during the focus group and the face to face interview will not be shared with anyone except myself and my supervisor, and they will be destroyed immediately the transcript have been made.

y) Will participants be required to complete a separate consent form? Many APD applications do not require participants to complete a separate consent form. Please see the templates provided.

☐ Yes. Names, addresses and copies of completed forms will be given to APD student office

☒ No. The data collection is anonymous and a combined information/consent sheet supplied

☐ Neither of the above, or the research involves participants under the age of 16

If 'neither of the above' selected, or the research involves participants under the age of 16, please outline the specific circumstances. Click here to enter text.

z) Will participants be offered any form of incentive for undertaking the research?

No ☐

Yes ☒

If yes, give brief details, including what will happen to the incentive should the participant later withdraw their input or decide not to proceed : Farmers that participate in the focus group discussion will receive £6 wrapped in the envelope with no name written. Those that participate in the face to face interview will also receive the same amount of incentive or its equivalent. None of the participants would be asked to return back the incentive if they later decide to withdraw their consent during or after the interview or focus group. The focus

group is expected to take a maximum of one (1) hour and a minimum of 45 minutes. The farmers will be told that they will be paid when the focus group finishes. if for some reason the farmer has to leave early, they will still get the payment so long as they have attended at least half the focus group (i.e. half the possible minimum time the focus group could take), and they will be handed an envelope on their exit. Moreover, it is important for me to be flexible in the field and to be able to use my judgement as to whether or not a farmer gets a payment

11. DATA PROTECTION

Data Storage, data protection and confidentiality. Please make sure you are familiar with the University of Reading's guidelines for data protection and information security. http://www.reading.ac.uk/internal/imps/

Please outline plans for the handling of data to ensure data protection and confidentiality. Covering the following issues: Will any personal information be stored? How and where will the data be stored? Who will have access to the data? When will it be deleted?

Personal data of the participants and any information from participants that is collected will be stored on a password-protected hard drive up until the completion of the research, and will be destroyed after finishing the research final report. The transcripts will be accessible by only me and my supervisor. There will be no personal information of the participants that would be revealed in the final report

Applicants: Please now scroll to Section 7 to input your :

- Information Sheet(s) for Participants (mandatory)
- Data Collection Tools, for example: recruitment materials, interview/focus group protocols (how you are conducting the process), interview/focus group questions, questionnaires, online survey questions, debriefing and fact sheets
- Consent Forms (optional, may not be necessary if consent assumed in Information Sheet)

If the text boxes do not allow input in the desired format, please append documents separately to the email when sending this form.

Please then email your completed form (and any separate supporting documents) to your supervisor/project investigator. Project investigators or independent academics may return form directly to sapdethics@reading.ac.uk

A decision on whether ethical clearance has been granted will be emailed to you via the APD Student Office along with your authorised form.

You may NOT proceed with your data collection until ethical approval has been granted as evidenced by return of this approved form.

Note: The process of obtaining ethical approval does not include an assessment of the scientific merit of the questionnaire. That is the separate responsibility of your supervisor/project investigator in discussion with yourself.

12. Supervisor/project investigator review. Section to be completed by supervisor/PI where relevant.

Participant information sheet(s), data collection tools and any other supporting information may be pasted in section 7 below. Alternatively they may be attached to this email. Please review these documents and then complete the checklist below.

Checklist. Does this application and supporting documents adequately address the following ?

- ☒ The safety of the researcher(s) and those collecting data, the safety of the participant(s)
- ☒ Is the language /grammar/content appropriate (i.e. University standards and reputation upheld)
- ☒ There are no questions that might reasonably be considered impertinent or likely to cause distress to the participants
- ☒ The researcher has provided the participant information sheet (mandatory)
- ☒ The researcher has provided the questionnaire or survey/ workshop, focus group or interview questions (mandatory)
- ☒ The Participant Information Sheet gives sufficient information for the participants to give their INFORMED consent
- ☐ A separate consent form has been included (optional)
- ☒ Data will be handled, stored and deleted appropriately according to University guidelines, and the participants have been adequately informed about this in the Participant Information Sheet
- ☒ The Participant Information Sheet contains all relevant sections
- ☒ I am satisfied that this application meets the minimum standards for APD Ethical Clearance to be granted

Supervisor/Project Investigator, please forward this form as a WORD document and any separate supporting documents to sapdethics@reading.ac.uk. The form will be logged by the student office and allocated to an APD ethics committee reviewer. The APD ethics reviewer will review the application and complete section 6.

13. APD ethics committee review. Section to be completed by APD Ethics Committee member.

Decision

Clearance refused ☐ Resubmission required

Clearance granted as presented ☐

Clearance granted subject to revisions suggested ☐ No need to resubmit once amended

Referred to APD Research Ethics Chair ☐ May require further information

Ethics Committee Member please enter comments, reasons for rejection, summary of revisions required before proceeding (if applicable):

Click here to enter text.

Committee Member Name: Click here to enter text. Date Reviewed : Click here to enter a date.

APD Ethics Committee member electronic signature (For signature, save document as pdf, then open pdf and use 'sign' option. Alternatively check here if no electronic signature used ☐)

APD Ethics Committee Member : Now please email this completed form (as signed pdf) to sapdethics@reading.ac.uk together with any separate supporting documents . The student office will record the outcome and return the completed form to the applicant with the decision.

14.Supporting Documents.

Please cut and paste the following documents into the text boxes below.

- Participant Information Sheet(s),
- Protocols (the procedures, how you will conduct and administer the data collection, interviews, surveys)
- Data Collection Instruments (interview questions and survey questions)
- Consent Forms (if Participant Information Sheet does not assume consent)
- Recruitment Materials (if relevant)

It is preferable that all information connected to this application is contained in one document. However, if you find that the text boxes below are not adequate, you may attach and email these supporting documents separately.

Supporting Documents for this application are pasted below. The text boxes cannot accept some types of formatting when pasting in documents. If this is the case, append them separately to the email with this form.

Participant Information Sheet

I am a PhD student at the University of Reading. I am conducting research into tomato value chain with particular interest in market contract, as part of requirement for the award of my doctoral degree.

This research project aims to enhance contract along tomato value chain particularly at the farmer-processor interaction.

To undertake this research, we are currently contacting farmers, traders, processors and some government officials. We would like to invite you to participate in an in-depth interview/focus group discussion taking place at the town hall which will take approximately 1 hour of your time. You have been selected because of your experience in marketing of tomatoes with either processors or traders and we are interested in hearing your views and understanding of the whole process. You are encouraged to freely express your opinions and please be assured that your views are valued and that there are no right or wrong answers to the questions asked.

I will store your name and email address so that I can contact you in 6 months' time to ask follow up questions. Your name and email address will be linked to your original responses by means of a keyed spreadsheet held separately. This spreadsheet and contact details will be password protected and the password known only to me and my supervisor, and will not be shared with any third parties. The spreadsheet will be kept on my password protected PC and will be destroyed at the end of my degree.

Participation is entirely voluntary and you are free to withdraw from the focus group/interview/survey at any time you feel uncomfortable or unwilling to participate, and you do not have to specify a reason. Any in-part or total contribution can be withdrawn within four weeks from the date of interview or focus group. After this period it will not be possible to withdraw your contribution.

The discussion will be audio or video recorded if you agree, and the anonymised transcripts of the audio/video recordings will be used by the researcher and the supervisors. Once transcribed the original recording will be deleted.

If at any stage you wish to receive further information about this research project please do not hesitate to contact the address provided below.

By participating in this interview/focus group discussion, you are acknowledging that you understand the terms and conditions of participation in this study and that you consent to these terms.

This research project has been reviewed according to the procedures specified by the University Research Ethics Committee, and has been given a favourable ethical opinion for conduct.

Thank you very much for taking time to take part in this focus group discussion.

Umar Shehu Umar

Student Contact Details

School of Agriculture, Policy and Development

Agriculture Building

Earley Gate, Whiteknights Road

PO Box 237

Reading RG6 6AR

United Kingdom

E-Mail: u.umar@pgr.reading.ac.uk

Supervisor Contact Details

Name: Prof. Elizabeth Robinson

Phone: +44 (0)118 378 5039

E-Mail: e.j.robinson@reading.ac.uk

Focus Group Discussion with Farmers

How do you decide which season to plant your tomatoes?

How do you decide what to do at the start of the season?

What are those things that you are certain and those that you are not certain about at the start of the season?

What high quality tomato means to you?

How does the quality link to price and demand from both fresh and processor's market?

How did you decide the of type tomato you plant last season?

How do you source your seeds?

Do you think of where to sell your tomatoes before planting?

How confident are you do that you will sell your tomatoes?

What do you do to increase the likelihood of selling your tomatoes in good price?

What arrangement do you have with processor last season?

What motivates you to engage into such arrangement?

What are the things that you think the processors shall consider while offering contract which will also motivate others to accept their contracts?

Who approaches who between you and processor last season?

How can you describe your connection with traders (i.e do you know them and often transact with them)?

How often do traders come to your farm or you are producing on assumption that they will come?

How do you get traders come to your farm?

What are your considerations in deciding where to sell your tomatoes?

How will you do in a situation where you already had an agreement with processors and traders visit your farm and offer you a price that is similar or relatively higher than the processor's offer?

Why are some farmers tempted to break the arrangement they had with processors if a trader come by looking for tomatoes to buy at price lower than the market price?

How consequential is breaking this arrangement?

Why do some farmer's respect the arrangement they had with processor's irrespective of better price and cash now?

What is the benefit of a membership of a particular association be it cooperative, farmer association e.tc. if there exist any?

How does the violation of any arrangement or agreement affect a benefit one may derive from his relationships with other business partners?

In-depth Interview with Processors

How did you sourced the quantity of tomatoes you determined to get last season?

What proportion of the tomatoes come from your own farm?

What determine the quality of tomato supplied to you last season?

How can you describe the quality of tomatoes you obtained from the various sources last season?

How does the quality link with the price?

What efforts did you make to get the exact quality of tomato you want last season from sources other than your own farm?

What is your most reliable source of tomato?

What circumstance made you to think about engaging farmers into contract or not?

How do you decide when and whom to contract, if you are engaging farmers into contract agreement?

How do you determine the most reliable community or area when you choose to offer contract?

What are you certain and uncertain about before you offer farmers contact?

How would you feel about farmers that make contract but end up selling to traders or spot market?

What effort did you make last year to avoid this situation if any?

In-depth Interview with Traders

How do you decide the areas you visited last season?

What are those factors that influenced the choices of the areas you had visited?

What determine the frequency at which you visit a particular area?

How important is price, quality and quantity to you while buying tomatoes from farmers?

What determine the quantity of tomatoes you are able to buy from farmers?

How do you determine the price you offer farmers last year?

How is the price you offer linked to quality?

What determine the quality of tomatoes you buy last year?

How did you get the right quality and quantity of tomato from the farmers in the areas you visited last year?

How does the presence of processors affect your relationship with farmers?

How do you do if you found that the farmers in the areas you visited have already signed contract with processors?

Click here to paste your supporting documents into a text box

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Appendix III: Samples of FGD and Interviews Transcripts

Focus Group Discussion Led Questions

1. How can you describe your experience of tomato production?

Majority of us spend many years in the marketing and production of tomato.
Like me I am into tomato for more than 15 years but look at Alhaji Ballo he was into tomato for more than 30 years because we all grew up and see him in this business and he cultivate more than 20Ha alone, but the least experienced amongst us is Sani who started 6 to 5 years ago after he finished secondary school.
FQ: what is the average Ha can the average person cultivate?
Majority of the farmers to be honest can produce 1 to 3 Ha and only few can go up to 20 or more Ha.

2.How do you decide what to do at the start of the season?

Mostly we mainly produce without certainty, we do not have any guaranteed market that you will be certain that it would be accepted, we only accepted whatever market decides.
The only reliable market most of us relied on is Kwanar Gafon . “Majority of us started dealing with Dangote processing company for the first time because of the anchor borrower program”.
“Many of us have no any business with the company if not because of the anchor borrower program”
We do not have any direct link to the company it is our Association leaders that is NATPAM that approaches us and advises us on the need to partner with the company in as much as we want to enjoy Federal Government Anchor Borrower program. So, all the inputs come to us through the Association.
“to cut it short it is NATPAM that link us to company”

3.How do you decide the sales of your tomatoes at the end of each season?

It all depends on what the market decides and the tomato variety because the variety needed by the company is its own variety but you can also produce other varieties like graftos or graphous because they attract more price but mostly farmers produce local varieties, we always look for better price, because this company sometimes will not accept all the tomatoes we produced. It do not have the capacity

4.How do you arrange your sales of tomato with processor’s last year?

we were given all the production input for one Ha including the seedlings of the company’s variety. “but for that is not enough for me and I have to look for other local variety to plant on the remaining lands”
“we have signed a written agreement with company that we will not side-sell and we will supply them after harvest”
“What he forgot to tell you is that we are agree on a fixed price of N40/kg”.

FQ: how satisfied are you with the arrangement?
"You know tomato is an uncertain business and you will not quickly say that you are satisfied because it depends on what the market would be at the time of harvest"
"The offer is not satisfactory but at least you have some level of insurance when fresh market is unfriendly.

4.What contract means to you?

written agreement to supply company with tomatoes after receiving production input from him.
"Without any tangible commitment a farmer has no any binding obligation on him"

5.What circumstances makes some farmers to change their mind and sell to other alternative market despite the previous arrangement they had with processors?

There was a time when the company accept supply from all farmers irrespective of whether you are offered a contract or not, but the price is very low and many people doesn't want go back to the company again.
Again sometimes you may spend 3-4days to the level were your tomatoes will begin to rot.
"to be honest we don't have any business with the company because it is a very difficult arrangement"
At first place the people the company should have approach for this type of arrangement are not the right people, because there are actual farmers who are dedicated to farming and have a vast experience in tomato farming and there are people who are only doing tomatoes for the sake of producing it and do not care to update their knowledge about tomato farming, and this latter category of farmers are the one whom the company approaches to offer contract and they only take advantage of the company.
"Like me even if the company does not offer any input and machine loan I can on my own produce more than 1 Ha" and I can produce more than 3 Ha comfortably and I always take it to fresh market and sometimes we get profit and sometimes we fail.
"How can you even think of the company while traders will down to the farm and buy tomatoes no payment of transport, no waiting on a queue and payment is instantaneous"

"in addition, they don't care about losses and me that need money instantly how can I wait on a queue and still wait to be get paid not cash and carry".
"when I was told the company is accepting tomatoes from all farmers, I first went go there to observe the process, I found that people have to follow a queue and to be honest I will not be able to follow a queue to sell my tomatoes, you will take your tomatoes to the company since 12pm but you will not be able to get yourself through until mid-night, and this honestly stopped me from participating".

6.What do you do to increase the likelihood of selling your tomatoes in good price?

tomato market is unpredictable no one knows what the price would be, the only thing we try to participate in both markets in such a way that you have some level of insurance by maintaining your relationship with both processors and traders.

7.Why are some farmers tempted to break the arrangement they had with processors if a trader come by looking for tomatoes to buy at a price that is relatively?

Many of us do not have the money to pay for laborers that work for us in the farm, because you have to pay those who will do the harvesting, loading and transport to the company. Because when you take your tomato to the company the payment is not instantaneous.
"sometimes the price do not have to be higher we have to sell to the traders to settle some pressing financial needs".
"had it being the company is coming to pick the tomatoes from farm itself it would have ease a lot". "to be honest some of us are inpatient they will not wait long, they will rather sell to traders to get their money on the spot".
"remember when you are taking tomatoes to company you have to pay transport and the payment takes time but for traders they will come with their truck , they pay for the loading and the payment is instant"
"the price offer is even better when the tomato variety is the company's variety"
FQ 1: How certain are you the traders will show up ?
They will definitely come because they use to come every year and they will definitely visit us, many of us have a good contact with them.
FQ2: How good is trader's price?
"their price is always better but they will select the best tomatoes, in fact they give the best price when the tomatoes are Dangote's variety because it can spend 10 days without any defect or change in morphological features"

8.Why are some farmers loyal to the company irrespective of better price option and cash now?

They already have a particular relationship with the company because if they are not having a relationship with company or they are not benefitting from the company how can they supply to company when a better opportunity presents itself. Because if you have a good relationship with the company you will not even suffer before their tomatoes is accepted.
"The company sometimes give money to these type of farmers that were in relationship with them for long to buy tomatoes for the company from the other farmers that are shunning the company"
"Hahahaha! What! Is very possible for some to do that but as others said it is an issue of relationship because even if the price is unfavoravle may be they will know there ways out"
"it is even irrational, you have a more profitable market at the farm-gate and the payment instantaneous and you still choose to go and suffer in the company, it must be a naiveness"

"as for me is not irrationality, sometimes no matter how higher the price is I will still supply some proportion to the company because you have to maintain that relationship against the bad times, because we have seen a situation when we will beg buyers to take tomatoes for free".
Sometimes the fresh market will fall down far below what we ever imagine and there is no magic you will do to raise the price up, but with the company the price is fixed and irrespective of the prices in fresh market. So, with the company at least you will get sorted but because of the delay many people will not want go to the company except when it is the only option. And sometimes price in fresh market can go at as high as N5,000 and to as low as N300. So only those who are able to maintain their relationship with the company will smile.
FQ: why are many of you not willing to establish relationship with the company to derive similar advantage against the unforeseen eventualities?
"it is mostly a personal choice many of us feel like the company is not the best because we don't think it will be able to take all the tomatoes we produce"
Sometimes if you know someone who is into contractual relationship for long you can sell your tomatoes to the company through him, this is what majority of us do. Because in such time the company consider the loyal farmers first.

9.How important is association membership particularly in regard to the sales arrangement you have had with processors?

If you are not a member there are a lot of services that you will not enjoy for example Harrow, fertilizer and pumping machines. A lot of other services that you will not enjoy.

"last year they gave us money to buy production inputs and how can you survive the production if you don't have the money to produce and all you have is the piece of land and you are not a member of the association".

10.What should the company do to attract so many farmers to respect the arrangement they had with the company?

As we told you earlier, you cannot predict what the market would be but most decisions of where to cell is determine by price. if the company will keep the price higher it will solve the problem. It certainly provide some level of insurance.
"I do not rely with the company, I always prefer selling to fresh market where I can get my money immediately"

In-depth Interviews with Traders

1. For how long have you been in this business?

2. How do you choose the areas you visited last year?
We don't consider anything, we only consider production seasons of areas, each production area has its own harvest season, depending on the availability of the tomato in the locations, sometimes you buy from Kadawa, sometimes Zaria,

sometimes Thomas and sometimes Kazaure bridge. So the one you got is the one you must definitely use and sometimes Badume. We go to everywhere we know they produce tomatoes we do not choose where and we accept every tomatoes here in this market.

FQ 1: is there any factor that inform you where or not to go?

"This is why we call the business of tomato "Gwari" meaning something that is undefined and unpredictable". It is a perishable commodity and we don't have the technology to like in other countries that you can use to keep it for at least 4 days without any physical defect. Or technology that you can use to process it. "it is now that Aliko Dangote is trying it". This is why wherever there is tomato we went there to buy it or brought to us by the farmers, because despite the quality type of tomato we sell it here. This market is more like an urban assembly market. We buy sell tomatoes to both urban and rural retailers

FQ 2: how about the areas that you always count or rely on?

"One of the most reliable area that constantly supply tomatoes is Kadawa" because the area is by the road side and it come with its good quality and not very far from market,unlike if you are to travel to remote area the change in weather that occur while transporting the tomatoes will cause some many physical deformation. Therefore, most of us prefer tomatoes coming from Kadawa due to the access road, and the tomatoes are bigger than the one obtained from zaria.

FQ: how often do you buy from Kadawa?

The harvest season in Kadawa is only once in a year and its normally start between December ending to February. And after that the other locations also pick up. You can see that out of the 12 months calendar year we always have a place to go and buy tomatoes from depending on the location.

3. How important is tomato price and quality to you?

You know that normally as traders who buy and sale tomatoes we only buy it from farm and sale it to retailers in the urban cities.

FQ 1: How do you determine the price you offer farmers??

As I have told *Gwari* stuffs has no price control, the price is volatile, for example if 500 baskets was supplied the price may be low because higher quantity of tomatoes supplied in the market make its price low and low quantity supply makes the price go up. For example in the morning you can find more than 5000 baskets and sometimes 10,000 baskets therefore the market will be catastrophic when you have this massive supply, "even in the money market when there is excess supply of a particular currency its value goes down because there is a lots of money in the hand of people" so this is how tomato is, and "is commodity that is non-storable and we must sell it at whatever price", even if you refuse to sell it today at the prevailing market price a lot more tomatoes may be coming tomorrow and if you are not careful all your tomatoes will rot.

FQ: How do you negotiate price with farmers?

FQ 2: how about any specific variety that is most preferred by traders in the market?

Yes we have it, because there is a tomato variety which farmers normally source from Turkey and Israel cultivated under greenhouse. The variety gives a bigger size tomatoes and is very firm like an apple and if you put it on this table it can stay for up to a week without showing any physical deformity. So that variety has a far better price, because if we sell the local variety at 5,000/ 20KG we will sell this variety at 10,000 per 20 KG because of its quality.

FQ: how then do the quality inform the price if you have different local varieties? If for example this is a basket of tomatoes that come from Kadawa and this from zaria and the quality differs, if you sell the quality one for 5000 the other may be 7000 or 6000?

FQ: is the difference in price due to location?

No because the quality difference, tomatoes that a bigger in size, firm and uniform are likely to have a better price, we do not care about the location the tomatoes are coming from.

4. How do the farmers' contract engagement with Dangote processing industries affect you?

   Yes it actually affects me for example if a trader went to buy tomatoes and found that company has already contracted the farmers at price better than that of traders, the farmer will definitely sell to the company and this affects us. But sometimes the company because they have policy they even bring down prices most especially when the quantity supply to the company is massive. If for example the company is buying it at N3,000 it may decide to change to N2,000 because the quantity supply is massive. Sometimes when the company learn that the prices in all other alternative markets are unfavourable may even bring down the price to as low as 1,500 from 3,000. And if you refuse to supply the company you may end up losing the tomatoes because even if you do not sell to the company many others are waiting to sell to them, so you have to sell to the company. "had it been the companies are many the might have compete for the good of the farmers"

   FQ: how do you survive the competition with the Dangote processing Company?

   The only thing to go about this is that when we found that the company had offered farmers a higher price say 5,000/basket I don't have option than to buy at the same price, and I can still take it to market and sell it at a profitable price because it scarce in the market. If the company buy it all there will be no tomatoes in the market but if I buy it at that same or slightly higher price it will still go through in the market because people will definitely buy.

   FQ: how does your relationship with some farmers help you in the time like this when company offered them the best deal?

   You know that we have a long term relationship with so many farmers and we buy tomatoes from them all year round even if the company is offering them a better price they can still supply you at a price that is slightly lower than that of company. "especially when you are a regular buyer. For example if a farmer produced 2000 baskets in all and the company price offer is best deal for farmer, a farmer can supply the company 1,200 baskets and supply 800 baskets to you being a regular customer. Because even if he do not sell the tomatoes to me time is coming when

the company may not continue to buy from him or the period when company is not buying tomato and he may want me to buy from him, so to maintain both relationship he has to sell some to me, may be share it between me and the company in the ration of 40:60, 30:70 or even 50:50.

5. What role do the trader association play in protecting the business of tomato marketing?

In-depth Interview with Processors

1. What initially motivate the company to enter into tomato processing?

The prospect of the business and the fact that currently there is no any single company in the country that is processing tomato. There were but they recently become more rebound because of the problem of importation. But we were determine to challenge the status quo and to push for policy change, because there is currently a partial ban. Because tomato concentrate is only allowed into the country on conditions. And the conditions are there is a levy $1,500 per container but this meant to discourage importation.

2. How do you do at the beginning of a season say last season?

We started this factory in the tomatoes producing area. One of the largest tomatoes producing area in the whole of the country. And when I say the largest producing area is because of the presence of irrigation infrastructure. They are the largest producer scheme in the whole country. This is what encourage us to establish our factory here and also because the farmers in these areas are used to producing tomatoes, they feel as if it is there lives. And we have seen the potential that we will not have problem with supply. And the major challenge actually to us is the fact that we produce concentrates and we don't have a branded product. We serve as a whole of concentrates, you cannot see our product in the market as a tomato paste. The whole idea was to produce concentrates and sell it to small packaging companies, they buy from us, dilute it and do whatever they like with it and sale it to consumers.

FQ: how do you survive the competition in the concentrates market?

We are the only company in Nigeria producing concentrates except those whom are imported and by the new government policy the imported tomato concentrates can't compete well in the local markets.

We also do not rely on the farmers we contracted but we also outsource from other farmers through our suppliers. This supplies outsourced tomatoes for us in the market at a price a bit higher than the contract price to encourage the supply because we don't give them seed we don't give them anything, they are not under us.

3. How do you determine what to do at the start of the season particularly last season?

We initially started an out-grower programme, we identify some farmers and also identify a lending institution, we brought the farmers to the lending institutions, they lend to them and we give them the seed on the agreement that we will uptake from them. But that did not work. At the end of the day farmers produce, they will neither repay their loans nor supply to the factory. That was just like a litmus test.

FQ: what actually think is the reason why most farmers failed supply you with the tomatoes despite the agreement?

You know this farmers are very unreliable, no matter what if the fresh market price is high they will not supply you?
FQ1: why do some farmers supply you despite the low prices?
Most of those farmers have are financially capable and they have a lot of concern for their integrity and business reputations. Most of them have a large landholdings
FQ:2 How does the initial plan of linking the farmers to lending institutions works?
What we do is we identify say 100 farmers and ask the lending institution such as Bank of Agriculture, Bank of Industry etc to screen them, give them certain conditions and give them the loans if they meet such conditions. The loan is given to the farmers in kind, that is in form of seeds, fertilizer and other farm inputs and on the agreement that they will sale their tomatoes to us after harvest. They only want take advantage of the contract to access the inputs and run away.
FQ3: how then do you get the right seed variety if it is the bank that is issuing farmers with the seeds?
No, we have the specified variety of seeds that suits, t and the bank has to engaged the chosen company responsible for supplying the seed variety. The company will supply the seed to the farmer and he will be paid by the bank.
FQ:4 how do you do after this out-grower scheme is proven inefficient?
We decided to engage all farmers willing to supply us on a flexible supply contract and take any type of tomatoes that the farmers are growing provided it is neither green nor is rot. It was also a trial. When we started taking the tomatoes from farmers the supply was not enough , we have a problem with pricing. Once the price of the tomato is very high in the market they will not supply us and when the price in the market is very low they come to us to start begging that we should increase our price so that they supply us. Naturally at the beginning of harvest season the price in fresh market go high and the company has some ceiling prices that it will not go beyond.
FQ: How do you sort the problem of price to encourage adequate supply?
What we do is to adopt a flexible pricing. The company together with the farmers set up a price and come to terms by monitoring the market price. The price is reviewed after every three (3) days. When the price in the fresh market is very high the company has its ceiling price that it will not go beyond and when the price in the fresh market is very low the company add premiums to farmers to incentivize supply. However, another problem we face with this approach of buying the local tomatoes from farmers is that it does not give the quality of brix and colour. And because of that we have to stop.
FQ: what actually motivate you to continue with your production now after you have stopped?

At the middle of this dilemma, we were approached by the Central Bank of Nigeria (CBN) to partake in the Anchor Borrower Programme (ABP). The broad objective of the ABP is to create economic linkage between smallholder farmers and reputable large-scale processors with a view to increasing agricultural output and significantly improving capacity utilization of processors. The programme thrust of the ABP is provision of farm inputs in kind and cash (for farm labour) to small holder farmers, through an anchor. Without an anchor the programme will not hold. The CBN intervention coming through the ABP is only accessible to farmers through farmer associations which serve as a guarantor to the farmers. Considering the capacity of our company, the program solely depend on us as an anchor buyer (off-takers) in the entire Northern Nigeria. We were funded by the CBN to produce the right seedlings and

the farmers access the seedlings from us at a cost payable in kind on the agreement that they will supply us with tomatoes after harvest at a fix price of N40/Kg. And for every farmer to access the seedlings he must first of all be a registered member of the farmer association. The farmers association issue agreement form for the farmer to fill and submit to the lending institution for them to get the Local Purchase order (LPO) that the farmer has to submit to the company to obtain the seedling.
FQ: how good is this arrangement compared to the previous ones?
This actually works better and our production is doing far better, "but you know you cannot trust this farmers as still some of them do side-sell which is a breach of the agreement".

FQ: How long does it takes a farmer to get his payment?
A farmer get his payment within 48 hours of

4. How do you decide when and whom to contract, if you are engaging farmers into contract agreement?

The company target the cold period, a period between December to February depending because tomatoes grow better. We make our contract open to all farmers willing to supply us. And we do not have any considerations but from experience most of the farmers that have large farm size participated more in our company.
FQ: what make those farmers that are more endowed more likely to participate in contract?

"Ah! You know dealing with company entails so many things, expenses in buying the seed variety desired by the company, and other necessary inputs may make most farmers not to participate in the contract, and of course some may not have the competence to grow the hybrid variety, they prefer local variety that is more resistant to disease"

5. How would you feel about farmers that make contract but end up selling to traders or spot market?

   "you know! It is natural to feel unhappy when somebody breaches your agreement but this farmers are always like that, you will never predict them"
   We have adopted so many strategies to encourage them to respect the agreement but they are always the same.
   "as have said, we adopted flexible pricing, we monitor market prices together with the farmers and agreed on the price, we review the price after every 3 days through constant monitoring, unfortunately there comes a time when fresh market price was very low were begging us to increase the price above the prevailing market price and we did, but guess what? Some days later the price in fresh market rises dramatically and beyond the company's ceiling price and many of these farmers failed to supply us".

   "Once Lagos market is promising you would be surprised to see how the supply is fluctuating in the company"

   FQ: What effort did you ever make to avoid this situation of contractual breach?

Honestly we did nothing to enforce contract but we always persuade them to comply with the contract. But sometimes we promised them incentives and future business opportunity

or add premium on top of the fixed price for example when the agreed fixed price is N40 we normally add N2.

“If we notice that a farmer accepted our seeds and other inputs and he reneges we just delist him”

FQ: why are you not doing anything to enforce contract?

“We care much about our business name and reputation. In fact, it will become a news headline when the richest man in Africa and a business mogul sue a poor farmer to court for defaulting contract”

This is why we only persuade farmers to comply with the contract by using any other avenues that will incentivize compliance.

Appendix IV: Survey Questionnaire

Participant Information Sheet

I am a Ph.D. student at the University of Reading in the UK. I am researching contract farming in Nigeria's Tomato Market with a particular focus on a farmer–processor interaction as part of the requirement for the award of my Doctoral degree.

This research project aims to explore how farmers and processors interact. As part of this research, I am contacting farmers that engaged in a contract with agro-processors to find out more about this interaction.

Umar Shehu Umar

School of Agriculture, Policy and Development
Agriculture Building
Earley Gate, Whiteknights Road
United Kingdom
E-Mail: u.umar@pgr.reading.ac.uk
Mobile Phone:

Survey Questionnaire

Section A: Social Capital

4. (a) How many tomato traders visited your farm last year……..?
   (b) How certain are you about the traders visit your farm every time you harvest your tomatoes?
   (2) Very certain (2) somewhat certain (3) undecisive (4)somewhat uncertain (5) very uncertain
5. (a) Are you a member of National Association of Tomato Growers, Processors and Marketers (NATPAM)?
   (2) Yes (2) No (3) Prefer not to Say
   (b) Are you a member of NGO or civic group?
   (1) Yes (2) No (3) Prefer not to Say
   (c) Are you a member A religious or spiritual group?
   (1) Yes (2) No (3) Prefer not to Say
   (d) Are you a member Finance, credit, or savings group?
   (1) Yes (2) No (3) Prefer not to Say

   (e) What is the benefit derived from the membership of any of the above organization?
   (1)Increases my access to extension services (2) Important in times of emergency/in future (3) Increases my access to loans 4) increases my social status and self-esteem (5) don't know (6) do not want to say (7) other……

Section B: Contract Participation, Compliance and Confidence

6. Have you ever engaged into tomato sales agreement with processor?
   (1) Yes (2) No (3) I don't want say
7. (a) Have you ever been in a contract with Dangote processing company and withdraw for some reason?

(1) Yes (2) No (3) I don't want say

(b) If Yes, choose any of the following reasons that apply;

(1) breach of agreement (2) High transaction costs (3) mistrust

(4)others……..

8. Are you currently in contract with Dangote Tomato processing company?

(1) Yes (2) No (3) I don't want say

9. (a) Are you into tomato sales agreement with the processor because of Anchor borrower program?

(1) Yes (2) No (3) I don't want say

(b) If No, for how long have you been in contract with Dangote processing company?.....(years)

10. (a) Would you say that "*I comply with all the terms of the contract*"?

(2) strongly disagree (2) disagree (3) Indecisive (4) agree (5)strongly agree

(b) Please tell us why you chose this response.....

4. how confident are you that Dangote processing company would be able to take up all the tomatoes from the farmers that engaged into tomato sales agreement with them?

(1) Strongly confident (2) Somewhat confident (3)Indecisive (4) somewhat unconfident (5) Strongly unconfident

Section B: Contract Design Attributes

11. (a) What type of tomato sales agreement do processors had with the farmers?

(1) Verbal (2) Written (3) No agreement (4) Others (specify)……..

(b) What is the common duration of the tomato sales agreement ?

(1) 1 year (2) 2 years (3) years (4) Not specified (5) Indefinite

12. (a)What type of price fixing mechanism do the processors commonly use when engaging farmers into tomato sales agreement?

(1) Fixed price (2) Flexible price (3) Other(specify)…….

13. (a) What payment option do the processors commonly use when engaging farmers into tomato sales agreement?

(2) Payment in advance (2) payment at the point of delivery (3) payment few days after delivery (4) payment at most a week after delivery (5) None (6) other (specify)……..

14. (a) Does the processor promised to give farmers bonus or any incentive when they want engage them into tomato sales agreement?

(2) yes (2) No

(b) if Yes, what ?.....

15. (a) Does the processor pronounced any threat or penalty to farmers for reneging the sales agreement at the initial stage of engagement?

(1)Yes (2) No

(b) If yes, which of the following penalty did the processor pronounced?

(1) contract termination (2) legal action (3) others (specify)……..

16. Does the processor provides production inputs loans which is payable in kind to tomato farmers that accept to engage into sale agreement? (1)Yes (2) No

17. Does the processor provides pumping machine loan which is payable in kind to tomato farmers that accept to engage into sale agreement? (1)Yes (2) No

Section C: Transaction Cost

18. (a) Which of the following delivery arrangement is agreed with the processor at the beginning of the contract last year?
    (2) Farmer to deliver tomatoes to Dangote (2) Dangote to take up tomatoes at the farm (3)others (specify)…….
    (b) How far are you from the Dangote processing company? (Km)……
19. (a) How much a farmer pays per crate to transport tomato from his farm to Dangote company? (in Naira)…….
    (b) How many crates/basket of tomatoes did you took to the Dangote processing company last year?.....
    (c) How long does a farmer has to wait in a queue with his tomatoes before collection starts at the company? (in days)…….
    (d) How long does it take for the tomatoes supplied to be screened before it is taken (hours)…….

Section D: Production information

10. What variety of tomato did you produced this year?
    (1) Roma (2) UC (3) Dangote (4) 1 &2 (5) 1 & 3 (6) 2 & 3 (7) Both.
11. (a) what type of crates/basket do you use?
    (1) Standard Crate (2) Lagos Basket (3) Bendel Basket
    (b) What is the size of the crate/basket…….(in Kg)
12. (a) Around which period of harvest did you sell most of your tomatoes to traders last year?
    (1) Early Harvest period (2) Mid Harvest period (3) Toward the End of Harvest (4) All eriod (5) None
    (b) At what price per unit did you sold the tomatoes to traders? (N)……..
    (c) How much higher is the trader's price compared to price offered by Dangote processing company last year?(Naira).....

Section E: Incident of Processors Contract breach (for contract farmers)

13. Has the processor respect the agreed payment option in 8(a) above?
    (2) Yes (2) No
    (aiii) If No, please choose the ones that applies to you
    (1) delayed Payment (2) Non-payment (3) partial payment (4) others (specify)…….
    (d) if (1) how long does it take you to receive your payment (in days)?.....
14. Has the processor fulfil his promise in a question 9 (a) above?
    (1) Yes (2) No

Section F: Socio-economic Characteristics

15. Age (years)…….
16. Educational Status
    (a) primary school or below; (b) junior middle school; (c) senior middle school or technical secondary school; (d) college or above
17. Years of experience in tomato farming……
18. Household size……..

19. Farm size under tomato production (Ha)……
20. (a) How much did you earned in a year from farm activities? (Naira)……..
    (b)How much did you earned in a year from off-farm activities? (Naira)……..
21. (a) Did you owned a bicycle? (1) Yes (2) No
    (b) If yes, how many……
22. (a)Did you owned a motorcycle? (1) Yes (2) No
    (b) If yes, how many……
23. (a) Did you owned a donkey? (1) Yes (2) No
    (b) If yes, how many ……
24. (a) Did you own a Lorry? (1) Yes (2) No
    (b) If yes, how many……
25. (a) Did you own Cattle? (1) Yes (2) No
    (b) If yes, how many……
26. (a) Did you own poultry? (1) Yes (2) No
    (b) If yes, how many……
27. (a) Did you own Goats? (1) Yes (2) No
    (b) If yes, how many ……

Section F: COVID-19 Impact

28. (a) Does the COVID-19 have any effect on your market transactions?
    (1) Yes (2) No (3) is difficult to Say
    (b) If Yes, in what way do you think COVID-19 has impacted on your business?
    (1) rise in inputs prices (2) rise in transportation cost (3) Both (4) I can't say (4) others……..
29. Is there any COVID -19 protocol that you put in place for safety during transactions?
    (1) Yes (2) No (3) is difficult to Say

Harvest	Date	Quantity Harvested	Unit a, b, or c	To whom sell is made						Transport paid per Unit (N)	Payment type (a)Instant (b)After (c)Advance	Variety (a)Dangote (b)Roma (c)UTC
				Pr	Unit price	Tr	Unit price	Mrkt	Unit price			
1st												
2nd												
3rd												
4th												
5th												
6th												
Note: Unit (a)=Crates(35-40Kg) Unit (b)= Lagos Basket (50-60Kg) Unit (c)= Bendel Basket (60-75Kg)												
Pr=processor, Tr=Trader, Mrkt=Fresh Market												

Appendix V: Stata output for Chapter 6

Summary statistics of Household heads Characteristics

```
Summary statistics: count mean sd min max
     for variables: Age HHSize Land_Size Farm_Income MExp_Proc MExp_Trad Trader_Den Dist_to_MRoad
```

	e(count)	e(mean)	e(sd)	e(min)	e(max)
Age	268	41.50746	10.23415	20	70
HHSize	268	11.35821	7.753122	1	50
Land_Size	268	2.599627	2.337822	.2	13
Farm_Income	268	535.7463	531.2329	45	2000
MExp_Proc	268	1.585821	1.169247	1	7
MExp_Trad	268	3.186567	6.203379	0	40
Trader_Den	268	3.548507	2.493714	0	10
Dist_to_MR~d	268	20.00933	22.25501	1	90

```
.
. esttab, label cells("mean sd min max") nomtitle nonumber noobs
```

	mean	sd	min	max
Age of the househo~e	41.50746	10.23415	20	70
Household size	11.35821	7.753122	1	50
Land size (in Ha)	2.599627	2.337822	.2	13
Annual Income ~1000)	535.7463	531.2329	45	2000
For how many years~n	1.585821	1.169247	1	7
For how many years~n	3.186567	6.203379	0	40
How many tomato tr~	3.548507	2.493714	0	10
Farm distance from~	20.00933	22.25501	1	90

```
.
. estpost tabulate Educ_Level
```

Educ_Level	e(b)	e(pct)	e(cumpct)
Primary_sc~l	77	26.92308	26.92308
Junior_sec~y	33	11.53846	38.46154
Senior_sec~y	85	29.72028	68.18182
Tertiary	91	31.81818	100
Total	286	100	

```
. esttab, cells ("b(label(freq)) pct(fmt(2))")
```

	(1) Educ_Level	
	freq	pct
Primary sc~l	77	26.92
Junior sec~y	33	11.54
Senior sec~y	85	29.72
Tertiary	91	31.82
Total	286	100.00
N	286	

```
. estpost tabulate Gender
```

Gender	e(b)	e(pct)	e(cumpct)
Male	279	98.23944	98.23944
Female	5	1.760563	100
Total	284	100	

```
. esttab, cells ("b(label(freq)) pct(fmt(2))")
```

	(1) Gender
	freq	pct
Male	279	98.24
Female	5	1.76
Total	284	100.00
N	284	

```
. eststo clear

.
. estpost tabulate W_Index_3categ
```

W_Index_3cat	e(b)	e(pct)	e(cumpct)
somewhat_W~y	183	66.30435	66.30435
moderately~y	68	24.63768	90.94203
wealthy	25	9.057971	100
Total	276	100	

```
. esttab, cells ("b(label(freq)) pct(fmt(2))")
```

	(1) W_Index_3c~g
	freq	pct
somewhat W~y	183	66.30
moderately~y	68	24.64
wealthy	25	9.06
Total	276	100.00
N	276	

```
. estpost tabulate M_NATPAM
```

M_NATPAM	e(b)	e(pct)	e(cumpct)
Member_NAT~M	175	61.40351	61.40351
Non-Member~M	110	38.59649	100
Total	285	100	

```
. esttab, cells ("b(label(freq)) pct(fmt(2))")
```

	(1) M_NATPAM	
	freq	pct
Member NAT~M	175	61.40
Non-Member~M	110	38.60
Total	285	100.00
N	285	

```
. eststo clear

.
. estpost tabulate P_ABP
```

P_ABP	e(b)	e(pct)	e(cumpct)
ABP_Partic~t	154	53.84615	53.84615
Non-ABP_Pa~t	132	46.15385	100
Total	286	100	

```
. esttab, cells ("b(label(freq)) pct(fmt(2))")
```

	(1) P_ABP	
	freq	pct
ABP Partic~t	154	53.85
Non-ABP Pa~t	132	46.15
Total	286	100.00
N	286	

```
. estpost tabulate contract_type
```

contract_typ	e(b)	e(pct)	e(cumpct)
Non-resour~g	199	69.58042	69.58042
Resource-p~g	87	30.41958	100
Total	286	100	

```
. esttab, cells ("b(label(freq)) pct(fmt(2))")
```

	(1) contract_t~e	
	freq	pct
Non-resour~g	199	69.58
Resource-p~g	87	30.42
Total	286	100.00
N	286	

```
. eststo clear

.
. estpost tabulate Covid_impact
```

Covid_impact	e(b)	e(pct)	e(cumpct)
Yes	244	85.61404	85.61404
No	41	14.38596	100
Total	285	100	

```
. esttab, cells ("b(label(freq)) pct(fmt(2))")
```

	(1) Covid_impact	
	freq	pct
Yes	244	85.61
No	41	14.39
Total	285	100.00
N	285	

Summary stats of Transaction level Data

```
Summary statistics: count mean sd min max
     for variables: Qtty_harv Proc_price Mrkt_price TTCost Load_cost Harvest_No
```

	e(count)	e(mean)	e(sd)	e(min)	e(max)
Qtty_harv	1279	3.888213	4.000105	.4025	15.4125
Proc_price	1279	36.12823	5.874201	27	40
Mrkt_price	1279	36.813	14.53543	18.66667	73.04348
TTCost	1279	4.034973	7.829006	0	28.44
Load_cost	1279	3.308084	8.190323	0	151.48
Harvest_No	1279	2.95778	1.54882	1	6

```
. esttab, cells("mean sd min max") nomtitle nonumber noobs
```

	mean	sd	min	max
Qtty_harv	3.888213	4.000105	.4025	15.4125
Proc_price	36.12823	5.874201	27	40
Mrkt_price	36.813	14.53543	18.66667	73.04348
TTCost	4.034973	7.829006	0	28.44
Load_cost	3.308084	8.190323	0	151.48
Harvest_No	2.95778	1.54882	1	6

```
. *Quali descrip stat
.
. estpost tabulate Comp_Beh
```

Comp_Beh	e(b)	e(pct)	e(cumpct)
Renege	688	53.29202	53.29202
comply	603	46.70798	100
Total	1291	100	

```
. esttab, cells("b(label(freq)) pct(fmt(2))") ///
>      varlabels(, blist(Total ))       ///
>      nonumber nomtitle noobs
```

	freq	pct
Renege	688	53.29
comply	603	46.71
Total	1291	100.00

```
. eststo clear

.
. estpost tabulate Payment_Type
```

Payment_Type	e(b)	e(pct)	e(cumpct)
Payment_Af~y	622	47.69939	47.69939
Instant_Pa~)	682	52.30061	100
Total	1304	100	

```
. esttab, cells("b(label(freq)) pct(fmt(2))") ///
>      varlabels(, blist(Total ))       ///
>      nonumber nomtitle noobs
```

	freq	pct
Payment Af~y	622	47.70
Instant Pa~)	682	52.30
Total	1304	100.00

```
. estpost tabulate Variety
```

Variety	e(b)	e(pct)	e(cumpct)
Others	557	42.71472	42.71472
Dangote_Hy~)	747	57.28528	100
Total	1304	100	

```
. esttab, cells("b(label(freq)) pct(fmt(2))") ///
>     varlabels(, blist(Total ))      ///
>     nonumber nomtitle noobs
```

	freq	pct
Others	557	42.71
Dangote Hy~)	747	57.29
Total	1304	100.00

```
. estpost tabulate Harv_season
```

Harv_season	e(b)	e(pct)	e(cumpct)
Early_season	391	29.93874	29.93874
Peak_season	533	40.81164	70.75038
Late_season	382	29.24962	100
Total	1306	100	

```
. esttab, cells("b(label(freq)) pct(fmt(2))") ///
>     varlabels(, blist(Total ))      ///
>     nonumber nomtitle noobs
```

	freq	pct
Early season	391	29.94
Peak season	533	40.81
Late season	382	29.25
Total	1306	100.00

Logistic Regression output

```
. *1
. eststo, title("Model 1"): logistic Comp_Beh i.Payment_Type i.Variety log_Qtty_harv Mrkt_price TTCost i.Harv_subp , vce(cluster Farmer_ID)

Logistic regression                                     Number of obs =  1,285
                                                        Wald chi2(7)  = 241.36
                                                        Prob > chi2   = 0.0000
Log pseudolikelihood = -180.10363                       Pseudo R2     = 0.7972

                                    (Std. err. adjusted for 282 clusters in Farmer_ID)
------------------------------------------------------------------------------
             |               Robust
    Comp_Beh | Odds ratio   std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
  Payment_Type |
Instant Payment (1=Yes) |   .0028586   .0013892   -12.05   0.000     .0011028    .0074097
  Variety |
Dangote Hybrid (1=Yes) |   4.074243   1.575919     3.63   0.000     1.908982    8.695451
  log_Qtty_harv |   1.660026   .2978803     2.82   0.005     1.167811    2.359702
  Mrkt_price |   .9405508   .0150302    -3.84   0.000     .9115486    .9704757
  TTCost |   1.105938   .0270708     4.11   0.000     1.054133     1.16029
  Harv_subp |
  peak subperiod |   1.095589   .4455567     0.22   0.822     .4937183    2.431175
  Late subperiod |   .4980014    .171979    -2.02   0.044     .2530918     .979903
  _cons |   35.71566   21.80045     5.86   0.000     10.79678     118.147
------------------------------------------------------------------------------
Note: _cons estimates baseline odds.
(est1 stored)
```

```
. *2
. eststo, title("Model 3"): logistic Comp_Beh i.Payment_Type i.Variety log_Qtty_harv Mrkt_price TTCost i.Harv_subp  i.Educ_Level i.M_NATPAM i.P_ABP HHSize i.Land_Tenure i.Wealth_Indx_Categ MExp_
> Proc Trader_Den  i.Covid_impact i.contract_type, vce(cluster Farmer_ID)

Logistic regression                             Number of obs =  1,212
                                                Wald chi2(23) = 280.69
                                                Prob > chi2   = 0.0000
Log pseudolikelihood = -163.8992                Pseudo R2     = 0.8042

                                (Std. err. adjusted for 267 clusters in Farmer_ID)
------------------------------------------------------------------------------
             |               Robust
    Comp_Beh |  Odds ratio   std. err.      z    P>|z|     [95% conf. interval]
-------------+----------------------------------------------------------------
ayment_Type  |
nt (1=Yes)   |   .0025092   .0013974   -10.75   0.000     .0008423    .0074745
             |
     Variety |
id (1=Yes)   |   4.893155   1.719377    4.52   0.000     2.457481    9.742889
g_Qtty_harv  |   1.739183   .3279471    2.93   0.003      1.20182    2.516815
  Mrkt_price |   .9366759   .0159258   -3.85   0.000     .9059764    .9684158
      TTCost |   1.121593    .029488    4.36   0.000     1.065261    1.180904
             |
   Harv_subp |
 subperiod   |   1.125738   .4734544    0.28   0.778     .4936798     2.56702
 subperiod   |   .4920704   .1684255   -2.07   0.038     .2515814    .9624451
             |
  Educ_Level |
 secondary   |   1.143728   .6164831    0.25   0.803     .3976631    3.289505
 secondary   |   2.662838    1.31683    1.98   0.048       1.0102    7.019111
   Tertiary  |    1.85232   .7517983    1.52   0.129     .8360653    4.103854
             |
    M_NATPAM |
ber NATPAM   |   1.943008   .7186232    1.80   0.073     .9411455    4.011365
             |
       P_ABP |
articipant   |   .7155131   .2814511   -0.85   0.395     .3309731     1.54683
      HHSize |   1.000164   .0187744    0.01   0.993     .9640357    1.037647
             |
 Land_Tenure |
  Leasehold  |   1.282494   .5406436    0.59   0.555     .5613395    2.930116
   Communal  |   .7730394   .9774902   -0.20   0.839     .0648451    9.215651
       Gift  |   1.628851   1.300681    0.61   0.541     .3405448    7.790917
  Purchased  |   2.588185   .9592853    2.57   0.010     1.251716    5.351614
             |
_Indx_Categ  |
 percentile  |   1.044574   .4566505    0.10   0.921     .4434292    2.460675
 percentile  |   1.108562   .4664313    0.24   0.806     .4859749     2.52875
             |
   MExp_Proc |   .7602688   .1217443   -1.71   0.087     .5554711    1.040574
  Trader_Den |   .8609847   .0672769   -1.92   0.055     .7387253    1.003478
             |
ovid_impact  |
          No |   1.391135   .5744413    0.80   0.424     .6192741    3.125042
             |
ntract_type  |
-providing   |   2.446635    .865225    2.53   0.011     1.223352    4.893133
       _cons |   28.83058    24.8938    3.89   0.000     5.307405    156.6118
------------------------------------------------------------------------------
stimates baseline odds.
```

```
. *3
. eststo, title("Model 3"): logistic Comp_Beh i.Payment_Type i.Variety log_Qtty_harv Mrkt_price TTCost i.Harv_subp i.Harv_subp#c.Mrkt_price i.Educ_Level i.M_NATPAM i.P_ABP HHSize  i.Land_Tenure
> i.Wealth_Indx_Categ MExp_Proc Trader_Den  i.Covid_impact i.contract_type, vce(cluster Farmer_ID)

Logistic regression                             Number of obs =  1,212
                                                Wald chi2(25) = 287.76
                                                Prob > chi2   = 0.0000
Log pseudolikelihood = -162.27596               Pseudo R2     = 0.8062
```

(Std. err. adjusted for 267 clusters in Farmer_ID)

Comp_Beh	Odds ratio	Robust std. err.	z	P>|z|	[95% conf.	interval]
Payment_Type						
Instant Payment (1=Yes)	.0024243	.0013437	-10.86	0.000	.000818	.0071843
Variety						
Dangote Hybrid (1=Yes)	4.904085	1.711068	4.56	0.000	2.474959	9.717352
log_Qtty_harv	1.710531	.317445	2.89	0.004	1.188948	2.46093
Mrkt_price	.9618304	.0192786	-1.94	0.052	.9247777	1.000368
TTCost	1.128872	.0298088	4.59	0.000	1.071934	1.188834
Harv_subp						
peak subperiod	6.917943	7.223501	1.85	0.064	.8936734	53.55193
Late subperiod	1.070929	1.014909	0.07	0.942	.1671419	6.861768
Harv_subp#c.Mrkt_price						
peak subperiod	.9507589	.0199969	-2.40	0.016	.9123625	.9907712
Late subperiod	.9770807	.021583	-1.05	0.294	.9356815	1.020312
Educ_Level						
Junior secondary	1.251761	.6486357	0.43	0.665	.4533641	3.456176
Senior secondary	2.584982	1.268424	1.94	0.053	.9880564	6.762904
Tertiary	1.907288	.7663064	1.61	0.108	.8678053	4.191895
M_NATPAM						
Non-Member NATPAM	1.95707	.730742	1.80	0.072	.9414122	4.068486
P_ABP						
Non-ABP Participant	.7076467	.2829081	-0.86	0.387	.3232339	1.54923
HHSize	.9998441	.0186133	-0.01	0.993	.9640202	1.036999
Land_Tenure						
Leasehold	1.230406	.5186016	0.49	0.623	.5386132	2.810735
Communal	.7642618	.996898	-0.21	0.837	.0592844	9.852439
Gift	1.423273	1.116135	0.45	0.653	.3060367	6.61916
Purchased	2.59602	.9467676	2.62	0.009	1.270209	5.305679
Wealth_Indx_Categ						
50th percentile	1.024138	.4337907	0.06	0.955	.4464964	2.349087
75th percentile	1.05987	.447529	0.14	0.890	.4632691	2.424776
MExp_Proc	.7394028	.1173234	-1.90	0.057	.5417741	1.009123
Trader_Den	.8550965	.0657965	-2.03	0.042	.7353911	.9942873
Covid_impact						
No	1.325313	.5366797	0.70	0.487	.5992774	2.930952
contract_type						
Resource-providing	2.38677	.8459046	2.45	0.014	1.191606	4.780664
_cons	12.8998	12.47619	2.64	0.008	1.937909	85.86819

Note: **_cons** estimates baseline odds.
(est3 stored)

Merged model

	Model A		Model B		Model C	
	Odd Ratio	se	Odd Ratio	se	Odd Ratio	se
Contract compliance beh~r						
Instant Payment (1=Yes)	0.003***	0.001	0.003***	0.001	0.002***	0.001
Dangote Hybrid (1=Yes)	4.074***	1.576	4.893***	1.719	4.904***	1.711
log_Qtty_harv	1.660**	0.298	1.739**	0.328	1.711**	0.317
Market price (in Naira/~)	0.941***	0.015	0.937***	0.016	0.962	0.019
Transport cost (in N1000)	1.106***	0.027	1.122***	0.029	1.129***	0.030
peak subperiod	1.096	0.446	1.126	0.473	6.918	7.224
Late subperiod	0.498*	0.172	0.492*	0.168	1.071	1.015
Junior secondary			1.144	0.616	1.252	0.649
Senior secondary			2.663*	1.317	2.585	1.268
Tertiary			1.852	0.752	1.907	0.766
Non-Member NATPAM			1.943	0.719	1.957	0.731
Non-ABP Participant			0.716	0.281	0.708	0.283
Household size			1.000	0.019	1.000	0.019
Leasehold			1.282	0.541	1.230	0.519
Communal			0.773	0.977	0.764	0.997
Gift			1.629	1.301	1.423	1.116
Purchased			2.588*	0.959	2.596**	0.947
50th percentile			1.045	0.457	1.024	0.434
75th percentile			1.109	0.466	1.060	0.448
For how many years have~n			0.760	0.122	0.739	0.117
How many tomato traders~			0.861	0.067	0.855*	0.066
No			1.391	0.574	1.325	0.537
Resource-providing			2.447*	0.865	2.387*	0.846
peak subperiod X Market~i					0.951*	0.020
Late subperiod X Market~i					0.977	0.022
Observations	1285		1212		1212	
Pseudo R-squared	0.797		0.804		0.806	

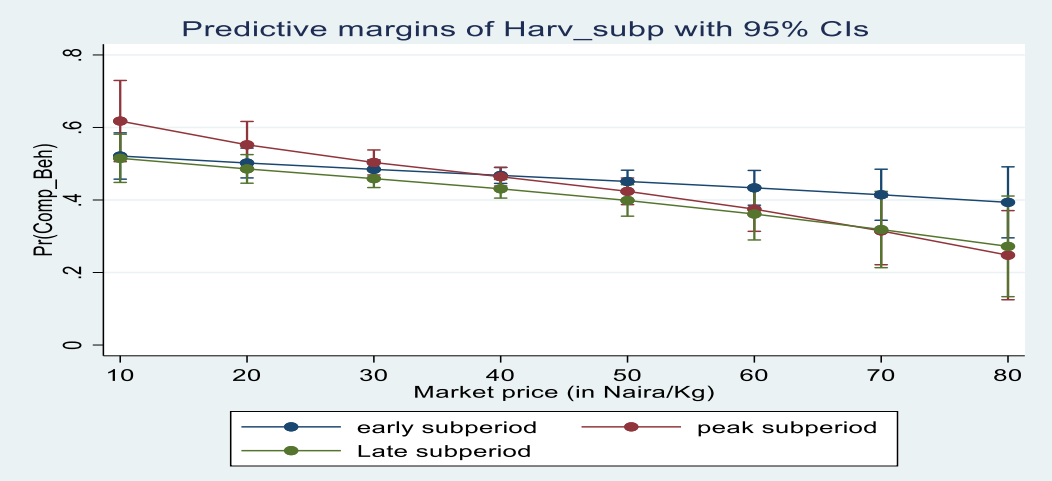
Exponentiated coefficients
Source: field survey 2021

Margins plot price vs. harvest subperiod

```
Expression: Pr(Comp_Beh), predict()
1._at: Mrkt_price = 10
2._at: Mrkt_price = 20
3._at: Mrkt_price = 30
4._at: Mrkt_price = 40
5._at: Mrkt_price = 50
6._at: Mrkt_price = 60
7._at: Mrkt_price = 70
8._at: Mrkt_price = 80
```

	Delta-method Margin	std. err.	z	P>|z|	[95% conf.	interval]
_at#Harv_subp						
1#early subperiod	.5213009	.032561	16.01	0.000	.4574825	.5851193
1#peak subperiod	.6176574	.0571309	10.81	0.000	.5056829	.7296319
1#Late subperiod	.5149688	.0339143	15.18	0.000	.4484979	.5814397
2#early subperiod	.5020143	.0209678	23.94	0.000	.4609183	.5431104
2#peak subperiod	.5521561	.0328773	16.79	0.000	.4877177	.6165944
2#Late subperiod	.4857312	.0201131	24.15	0.000	.4463101	.5251522
3#early subperiod	.4844812	.0132914	36.45	0.000	.4584304	.5105319
3#peak subperiod	.5034533	.0176117	28.59	0.000	.468935	.5379716
3#Late subperiod	.4588884	.0125306	36.62	0.000	.4343289	.483448
4#early subperiod	.4678049	.0112568	41.56	0.000	.445742	.4898677
4#peak subperiod	.4641638	.0130771	35.49	0.000	.4385332	.4897943
4#Late subperiod	.4308265	.0130591	32.99	0.000	.4052311	.4564219
5#early subperiod	.4510899	.0158519	28.46	0.000	.4200208	.482159
5#peak subperiod	.4238791	.0187583	22.60	0.000	.3871135	.4606447
5#Late subperiod	.3987653	.0221485	18.00	0.000	.355355	.4421756
6#early subperiod	.4335306	.024463	17.72	0.000	.385584	.4814772
6#peak subperiod	.374776	.031238	12.00	0.000	.3135507	.4360014
6#Late subperiod	.3612945	.0364913	9.90	0.000	.2897728	.4328163
7#early subperiod	.4144804	.0359018	11.54	0.000	.3441143	.4848466
7#peak subperiod	.3147577	.0475965	6.61	0.000	.2214704	.4080451
7#Late subperiod	.3185526	.0536842	5.93	0.000	.2133336	.4237717
8#early subperiod	.3934974	.0499562	7.88	0.000	.295585	.4914099
8#peak subperiod	.2477951	.0627092	3.95	0.000	.1248874	.3707028
8#Late subperiod	.2721251	.0708234	3.84	0.000	.1333139	.4109363

```
. marginsplot
```



Appendix VI: Stata Output for Chapter 7

Summary statistics of collapsed Transaction level Data

```
. tabulate Payment_Type, generate(Payment_Typedum)
```

Type of payment made to the farmer	Freq.	Percent	Cum.
Payment After Delivery	622	47.70	47.70
Instant Payment (1=Yes)	682	52.30	100.00
Total	1,304	100.00	

```
. tabulate Variety, generate(Varietydum)
```

Tomato variety transacted by the farmer	Freq.	Percent	Cum.
Others	557	42.71	42.71
Dangote Hybrid (1=Yes)	747	57.29	100.00
Total	1,304	100.00	

```
. tabulate Harv_season, generate(Harv_seasondum)
```

Harvest season	Freq.	Percent	Cum.
Early season	391	29.94	29.94
Peak season	533	40.81	70.75
Late season	382	29.25	100.00
Total	1,306	100.00	

Goodman and Kruskal Gamma

```
. tabulate P_Comp_3categ O_Comp_3Categ2, gamma nokey row
```

Expected Compliance	Observed Compliance: low Compl	Moderate	High Comp	Total
low compliance	27	32	18	77
	35.06	41.56	23.38	100.00
Moderate compliance	6	12	6	24
	25.00	50.00	25.00	100.00
High compliance	57	79	41	177
	32.20	44.63	23.16	100.00
Total	90	123	65	278
	32.37	44.24	23.38	100.00

gamma = 0.0121 ASE = 0.097

Ordered Logistic Regression Models

```
. eststo, title("Model 1"): ologit P_Comp_3categ Del_Pymnt Dgt_Var i.Qtty_harv_Categ Mrkt_price TTCost Peak_period i.Educ_Level i.M_NATPAM i.P_ABP HHSize Land_Size i.Wealth_Indx_Categ MExp_Proc
> Trader_Den i.Bonus i.contract_type i.Covid_impact , vce(robust)

Iteration 0:   log pseudolikelihood = -220.09845
Iteration 1:   log pseudolikelihood = -182.20767
Iteration 2:   log pseudolikelihood = -180.43914
Iteration 3:   log pseudolikelihood = -180.42863
Iteration 4:   log pseudolikelihood = -180.42863

Ordered logistic regression                     Number of obs =    262
                                                Wald chi2(21) =  55.43
                                                Prob > chi2   = 0.0001
Log pseudolikelihood = -180.42863               Pseudo R2     = 0.1802
```

P_Comp_3categ	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	interval]
Del_Pymnt	.3648019	.5844641	0.62	0.533	-.7807266	1.51033
Dgt_Var	-.4277931	.3322032	-1.29	0.198	-1.078899	.2233131
Qtty_harv_Categ						
Moderate Quantity	-.085482	.6206002	-0.14	0.890	-1.301836	1.130872
High Quantity	.5668546	1.083917	0.52	0.601	-1.557583	2.691292
Mrkt_price	.0018844	.0133055	0.14	0.887	-.0241938	.0279627
TTCost	-.0384881	.0555565	-0.69	0.488	-.1473768	.0704006
Peak_period	-.8770087	1.090444	-0.80	0.421	-3.014239	1.260222
Educ_Level						
Junior secondary	1.224165	.5589051	2.19	0.029	.1287308	2.319598
Senior secondary	1.581879	.4824605	3.28	0.001	.6362734	2.527484
Tertiary	.323928	.3726313	0.87	0.385	-.4064159	1.054272
M_NATPAM						
Non-Member NATPAM	-.7117981	.3260841	-2.18	0.029	-1.350911	-.072685
P_ABP						
Non-ABP Participant	-.8749857	.3473783	-2.52	0.012	-1.555835	-.1941367
HHSize	-.0166161	.019186	-0.87	0.386	-.0542201	.0209878
Land_Size	.0751755	.0691608	1.09	0.277	-.0603771	.2107281
Wealth_Indx_Categ						
50th xtile Wealth Index	.5714615	.3765934	1.52	0.129	-.1666481	1.309571
75th xtile Wealth Index	.7986785	.392547	2.03	0.042	.0293005	1.568057
MExp_Proc	.1205683	.1325421	0.91	0.363	-.1392094	.380346
Trader_Den	-.1168614	.0582615	-2.01	0.045	-.2310518	-.002671
Bonus						
No Bonus	-.0874414	.435192	-0.20	0.841	-.940402	.7655192
contract_type						
Resource-providing	-1.119894	.3428455	-3.27	0.001	-1.791859	-.447929
Covid_impact						
Not Affected by covid	-1.414799	.3886656	-3.64	0.000	-2.17657	-.6530289
/cut1	-2.025427	1.285481			-4.544923	.4940695
/cut2	-1.518195	1.273927			-4.015046	.9786558

(est1 stored)

```
. eststo, title("Model 2"): ologit O_Comp_3Categ2 Del_Pymnt Dgt_Var i.Qtty_harv_Categ Mrkt_price TTCos
> t Peak_period i.Educ_Level i.M_NATPAM i.P_ABP HHSize Land_Size i.Wealth_Indx_Categ MExp_Proc Trader_
> Den i.Bonus i.contract_type i.Covid_impact, vce(robust)

Iteration 0:   log pseudolikelihood = -278.77999
Iteration 1:   log pseudolikelihood =  -102.7222
Iteration 2:   log pseudolikelihood = -72.232794
Iteration 3:   log pseudolikelihood = -61.479622
Iteration 4:   log pseudolikelihood = -61.180499
Iteration 5:   log pseudolikelihood =  -61.17881
Iteration 6:   log pseudolikelihood =  -61.17881

Ordered logistic regression                           Number of obs =    262
                                                      Wald chi2(21) =  77.85
                                                      Prob > chi2   = 0.0000
Log pseudolikelihood = -61.17881                      Pseudo R2     = 0.7805
```

O_Comp_3Categ2	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	interval]
Del_Pymnt	-14.4838	3.398991	-4.26	0.000	-21.14571	-7.821904
Dgt_Var	-1.119885	.4460231	-2.51	0.012	-1.994074	-.2456959
Qtty_harv_Categ						
Moderate Quantity	.9623729	.671018	1.43	0.152	-.3527983	2.277544
High Quantity	-4.76877	1.404054	-3.40	0.001	-7.520665	-2.016874
Mrkt_price	-.0355814	.0252604	-1.41	0.159	-.0850907	.013928
TTCost	.28924	.0710025	4.07	0.000	.1500777	.4284022
Peak_period	.4933358	2.147204	0.23	0.818	-3.715106	4.701777
Educ_Level						
Junior secondary	1.098188	.8010851	1.37	0.170	-.4719095	2.668286
Senior secondary	2.423785	.8701699	2.79	0.005	.7182836	4.129287
Tertiary	2.12142	.6798944	3.12	0.002	.7888514	3.453989
M_NATPAM						
Non-Member NATPAM	.9471551	.384227	2.47	0.014	.1940841	1.700226
P_ABP						
Non-ABP Participant	.0008852	.549911	0.00	0.999	-1.076921	1.078691
HHSize	-.0175661	.0277546	-0.63	0.527	-.0719642	.036832
Land_Size	.1487224	.0822826	1.81	0.071	-.0125485	.3099933
Wealth_Indx_Categ						
50th xtile Wealth Index	.8672352	.5765407	1.50	0.133	-.2627638	1.997234
75th xtile Wealth Index	.7398479	.4975427	1.49	0.137	-.2353179	1.715014
MExp_Proc	.2044068	.1505594	1.36	0.175	-.0906841	.4994977
Trader_Den	-.2073646	.0750809	-2.76	0.006	-.3545205	-.0602087
Bonus						
No Bonus	1.860869	.8511046	2.19	0.029	.1927346	3.529004
contract_type						
Resource-providing	.6745758	.4998494	1.35	0.177	-.305111	1.654263
Covid_impact						
Not Affected by covid	-1.247998	.7421393	-1.68	0.093	-2.702565	.2065679
/cut1	-9.15845	2.520368			-14.09828	-4.21862
/cut2	1.611247	1.300328			-.9373491	4.159843

(est2 stored)

```
. eststo, title("Model 3"): ologit Comp_Diff_Categ Del_Pymnt Dgt_Var i.Qtty_harv_Categ Mrkt_price TTCo
> st Peak_period i.Educ_Level i.M_NATPAM i.P_ABP HHSize Land_Size i.Wealth_Indx_Categ MExp_Proc Trader
> _Den i.Bonus i.contract_type i.Covid_impact, vce(robust)

Iteration 0:   log pseudolikelihood = -267.15618
Iteration 1:   log pseudolikelihood = -209.20944
Iteration 2:   log pseudolikelihood = -206.79348
Iteration 3:   log pseudolikelihood =  -206.7737
Iteration 4:   log pseudolikelihood =  -206.7737

Ordered logistic regression                           Number of obs =    262
                                                      Wald chi2(21) =  96.92
                                                      Prob > chi2   = 0.0000
Log pseudolikelihood = -206.7737                      Pseudo R2     = 0.2260
```

Comp_Diff_Categ	Coefficient	Robust std. err.	z	P>|z|	[95% conf.	interval]
Del_Pymnt	2.794612	.5763298	4.85	0.000	1.665026	3.924197
Dgt_Var	-.4384842	.3389608	-1.29	0.196	-1.102835	.2258667
Qtty_harv_Categ						
Moderate Quantity	-.2469949	.5594479	-0.44	0.659	-1.343493	.8495028
High Quantity	.7684822	.7887199	0.97	0.330	-.7773805	2.314345
Mrkt_price	-.0006672	.0119609	-0.06	0.956	-.0241101	.0227756
TTCost	-.0803808	.0473845	-1.70	0.090	-.1732528	.0124911
Peak_period	-1.1084	1.128621	-0.98	0.326	-3.320456	1.103656
Educ_Level						
Junior secondary	.7600378	.4918542	1.55	0.122	-.2039787	1.724054
Senior secondary	.859078	.4431688	1.94	0.053	-.0095169	1.727673
Tertiary	.0791407	.3862219	0.20	0.838	-.6778402	.8361216
M_NATPAM						
Non-Member NATPAM	-.5139727	.2992257	-1.72	0.086	-1.100444	.072499
P_ABP						
Non-ABP Participant	-.7572195	.3545807	-2.14	0.033	-1.452185	-.0622542
HHSize	-.0138737	.0178321	-0.78	0.437	-.0488241	.0210766
Land_Size	.0600794	.0584688	1.03	0.304	-.0545174	.1746762
Wealth_Indx_Categ						
50th xtile Wealth Index	.5010868	.3707534	1.35	0.177	-.2255765	1.22775
75th xtile Wealth Index	.6922379	.373285	1.85	0.064	-.0393873	1.423863
MExp_Proc	.0651402	.120463	0.54	0.589	-.170963	.3012433
Trader_Den	-.0643023	.0561282	-1.15	0.252	-.1743115	.0457068
Bonus						
No Bonus	.0396913	.3660767	0.11	0.914	-.6778058	.7571884
contract_type						
Resource-providing	-1.066	.3387206	-3.15	0.002	-1.72988	-.4021194
Covid_impact						
Not Affected by covid	-1.075849	.3834093	-2.81	0.005	-1.827317	-.3243805
/cut1	-1.79216	1.192604			-4.129621	.5453008
/cut2	.125552	1.175056			-2.177515	2.428619

(est3 stored)