The extent that certain dairy farmer attitudes and behaviors are associated with farm business profitability

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1   **INTRODUCTION**

2   Farmer attributes have received relatively little attention as drivers of farm profitability. This

3   is especially clear when contrasted with factors such as enterprise type and farm scale. The

4   few studies examining farmer attributes have shown that they can be predictive of

5   profitability to a similar or greater degree. Mäkinen (2013) found that farmers' 'management

6   thinking' attitudes and beliefs were strongly predictive of dairy farm profitability. Herrmann

7   (2016) reported that managers' 'commitment' and 'discipline' were moderately correlated to

8   farm performance. However, these few studies did not fully explore the role of attitudes and

9   beliefs. Furthermore, no application of these insights has been reported as far as we are

10   aware.

11

12   Using such insights, farm performance and profitability could potentially be improved. This

13   would be a novel and potentially highly effective approach. This could be achieved during

14   the training, or hiring of, farm managers through the measurement and management of

15   attributes associated with farm profitability. There is a well-established occupational-

16   psychology literature demonstrating strong and consistent associations between employee

17   (including managers) attributes and job performance (e.g. Hunter & Hunter 1984; O'Boyle et

18   al., 2011). Application of such insight in agriculture would, however, benefit from further

19   research in an agricultural context. Confirming that the associations found in general

20   occupational psychology studies exist in different groups of farmers, and how best to apply

21   these insights effectively, would be valuable. This paper contributes to the former by

22   investigating the association between the attributes of farmers in Great Britain (GB) and farm

23   profitability.

24

25   Of the range of attributes studied to date, farmer beliefs and attitudes have been found to be

26   associated with farm profitability (Table 1). Farmer behaviours and actions have been

27   investigated relatively more frequently than attitudes and beliefs. However, only moderate

28   associations with farm performance have been reported for specific behaviours compared to

29   relatively stronger associations found in the few studies examining attitudes and beliefs

30   (Nuthall, 2010; Mäkinen, 2013; Herrmann, 2016). This implies that farmer attitudes and

31   beliefs may be more predictive of farm profitability than specific farmer actions and

32   behaviours.

33

34   An attitude is an expression of favour/disfavour toward a person, place, practice or event. A

35   belief, or conviction, is a psychological state where someone holds a specific premise to be

36   true or not. As they are both closely related concepts, attitudes and beliefs, objectives and

37   goals will henceforth be referred to together as 'attitudes'. Behaviours relate to a person's

38   response to particular situations or stimulus (Jones et al., 2016). Specific management

39   practices (such as benchmarking) are also aggregated together with other behaviours as a

40   subset of 'behaviours'.

41

42   That farmers are motivated by factors besides profit is well-documented (see, for example,

43   Edwards-Jones, 2006; Gasson, 1973). Attitudes relating specifically to profit have been given

44   a range of labels such as 'business orientation' and 'profit maximiser' though they arguably

45   describe very similar constructs. 'Entrepreneurial orientation', 'strategic thinking' and

46   instrumental values (e.g. means to an end, making money) were found predictive of financial

47   performance by Mäkinen (2013). These three measures loaded on a construct called

48   'managerial thinking' that was highly predictive of profit.

49

50   Following a comprehensive literature review, the attitudes that appear advantageous for a

51   profitable farm business from 10 selected studies are shown in Table 1. In general, viewing

52   farming as a lucrative business combined with seeing it as a way of life appears to positively

53   predict financial performance (e.g. Mäkinen, 2013). Encouraging farmers to embrace these

54   attitudes or challenge contrary attitudes, may thus increase farm profitability.

55

56   Other attitudes have also been linked to profitability. Herrmann (2016) found that farms run

57   by those who placed greater value on their own leisure had smaller increases in equity over

58   three years than those that did not. Nuthall (2010) found that those who prioritised risk

59   reduction had more profitable farms than those that did not. Believing that farming delivers

60   more than just food, but also public goods, was found to be associated with greater technical

61   efficiency by Barnes (2006).

62

63   The study reported here explored whether the attitudes and behaviour of farmers as

64   operationalised in the Theory of Planned Behaviour (Ajzen, 1991) were associated with the

65   profitability of their dairy farms in GB, as measured by their farm accounts data. The sample

66   used is not especially representative so the objective is not to accurately estimate statistically

67   the prevalence of attitudes and behaviours in GB dairy farmers, but to identify associations

68   and patterns which are likely to generalise to GB dairy farmers, dairy farmers in other

69   countries and other GB farmers. Below, the profit measure used as a proxy for management

70   performance, is first discussed. Then, an exploratory correlation analysis of the participants'

71   survey responses, attributes and their associations with their farm profitability is examined.

72   The results of a linear regression model using these variables follow, which predicts a

73   significant proportion of the variation in farm profit of the study farms. The findings are then

74 summarized and discussed before conclusions and recommendations based on the study's

75 findings are presented.

MATERIALS AND METHODS

77 *The questionnaire used*

78 A questionnaire containing 83 questions was initially developed in early 2012. This was

79 based on the findings of a review of the literature and discussions with a group of

80 experienced farm management consultants. The questionnaire had five sections with

81 questions on: farm management style; staff management practices; business goals and

82 objectives; personal views on management; and socio-demographic characteristics of the

83 farmer/farm manager and their farm business. The majority of the questions (59/83) consisted

84 of propositional statements to which respondents had to indicate their level of agreement on a

85 5-point Likert scale with 1 being 'Agree strongly' and 5 being 'Disagree strongly'. Each of

86 the questions were exploratory and were hypothesised to be potentially associated with farm

87 profitability. Some themes judged to be more likely to be associated with profitability were

88 addressed by multiple questions. These were asked in different ways e.g. negatively or

89 positively framed, or assessing a closely related aspect. These could be considered as being

90 in either the 'attitudes' or 'behaviour' constructs of the Theory of Planned Behaviour (TPB)

91 framework of Ajzen (1991). Figure 1 illustrates how the study reported here investigated the

92 role of behaviours and attitudes as potential predictors of dairy farm profitability based on the

93 TPB framework.

94

95 Example statements/questions which relate to attitudes were: 'Increasing turnover is essential

96 for long-term success'; 'Content cows are a major source of pride'; and 'Staff entering the

97 industry lack important skills and knowledge'. Example statements/questions relating to

4

98 behaviours were: 'I buy most of my inputs from one or two local suppliers'; and 'I don't

99 usually pay for staff training as they may leave after and/or I would rather do it myself'.

100

101 Experienced farm management researchers (the authors and others) revised the first draft

102 questionnaire which was then followed by pilot testing on 4 individual farmers. The resulting

103 final version of the questionnaire (the questionnaire is available from the corresponding

104 author or from https://goo.gl/ZnuWUz) was then mailed to 234 dairy farmers who were

105 clients of the business services of Promar International (a major agri-food consultancy

106 organization) in the spring of 2012. Following written and verbal reminders, 101 responses

107 were elicited (a 43% response rate), 21 of which were then discounted from the analysis for

108 incompleteness. This resulted in a final sample of 80 (a 34% response rate) of those

109 questionnaires distributed.

110

111 *Sample characteristics*

112 The participants managed either specialist dairy, or mixed dairy, farms with a herd size of

113 milking cows between 34 and 453 with a sample mean of 198 (Table 2). This was larger than

114 the UK average of 126 at that time (DairyCo, 2013a). However, the sample was

115 representative in other key respects. For example, mean yield per cow was 7,595 litres,

116 similar to the UK average of 7,604 in 2011/12 (DairyCo, 2013b), and the average age of the

117 participants was 50.5 years compared with the national average of 51.4 (Farm Business

118 Survey Team, 2012). In terms of geographical spread, South Wales and Scotland were under-

119 represented. Whilst these sample characteristics are not ideal, for an exploratory study such

120 as the one reported here, it can be described as 'satisfactory'.

121

122 *Profitability as a proxy for farm manager performance*

123 A profit-based measure was deemed the most appropriate proxy of success or generally

124 desirable outcomes. The measures 'Return on Assets' and 'Return on Equity' were considered,

125 but discounted as the necessary land valuations were not updated regularly in the farm

126 management accounts data set used. Net Farm Income (NFI) was identified as being a

127 relatively fair measure of profitability to assess the performance of a manager as it adjusts for

128 rent and unpaid family labour which are generally outside managers' control in the short to

129 medium term. However, it was not possible to calculate NFI in the study reported here as an

130 estimate of unpaid family labour was not collected in the dataset used.

131

132 Therefore, a similar measure of profitability was selected - Profit Before Resource Costs

133 (PBRC). This is a profitability measure that does not include costs such as rent on land or

134 finance charges on borrowed capital but does include wages paid to both family and regular

135 hired farm staff. As rent and finance are mostly attributable to an individual farm's resource

136 base or endowment, the everyday actions of the farmer or farm manager, at least in the short

137 and medium-term, can only have limited impact on these factors (Table 2). To see, in a

138 detailed way, how PBRC is calculated, the reader should refer to the Appendix of this paper.

139 There, an annotated version of an example set of farm accounts is presented.

140

141 Three other measures of financial performance were also calculated. First, to avoid bias due

142 to business size, PBRC divided by turnover was calculated. Second, PBRC was also

143 calculated with 'real' wages of family and regular labour added back in. Third, PBRC

144 divided by turnover was also calculated with 'real' recorded wages added back in. This latter

145 measure is, in one sense, a superior measure to NFI as only bank-reconciled figures were

146   used and the participating farmers were not required to estimate the value of unpaid family

147   labour which would be likely to introduce some inaccuracy.

148

149   To minimise the effects of annual variation through factors such as unusual weather or

150   commodity price volatility, financial performance means were calculated over three financial

151   years - 2011/12 to 2013/14. The questionnaire survey which collected the attitudinal and

152   socio-demographic data was carried out during the spring of 2012 i.e. near to the end of the

153   first of these three financial years, approximately one third of the way through the financial

154   period assessed. The financial data was collected routinely each year for the purpose of

155   preparing farm management accounts for their clients by Promar International.

156

157   The four 'profit' measures considered each adjust for certain biases that might impact the

158   apparent influence of the farm manager on profitability. Although these measures are

159   inherently similar and closely related, they are distinct with the correlations between them

160   ranging from 0.43 to 0.93 (Table 3).

161

162   PBRC with wages added back and divided by turnover was judged as the measure most

163   indicative of desirable outcomes or success attributable to the farm manager, being

164   independent of those variables that are outside the farmer or farm manager's control. In the

165   results that follow, and the tables that are shown, this measure is referred to as:

166   (PBRC+Wages)/Turnover.

167   **RESULTS**

168   *Univariate analysis*

169   Statistically significant correlations of socio-demographic parameters with the financial

170   performance measure chosen close to, or below, the $p < 0.05$ threshold are listed in Table 4

171   along with mean scores and standard deviations for each response. Spearman's non-

172   parametric correlation analysis (rho) was used. A few variables with a p- value greater than

173   0.05 are reported as they are included in the multi-variate analysis reported on below.

174

175   About 10% of profitability variation can be predicted by how profit-focused farmers said they

176   are. Most respondents agreed tentatively (41%) and a few agreed strongly (15%). Around

177   25% were neutral and 19% disagreed. By the survey farmers' own assessment, there is scope

178   for the majority of their farm businesses to be more profit-orientated. The most highly

179   correlated attitudinal variable with profit was the respondents' own assessments of whether

180   increasing turnover is essential for long-term success.

181

182   Many of the study farmers appeared to have a negative view of continuing personal

183   development. Several variables indicative of this view were also strongly correlated with

184   profitability. For example, the most highly correlated of these to profitability was the reported

185   provision of training for staff and themselves (rho - 0.29). The educational attainment level of

186   the manager was also positively correlated but to a lesser extent (0.21, $p=0.06$). Specifically,

187   a formal agricultural training qualification appears to be beneficial.

188

189   Respondent age and years of management experience were not significantly correlated

190   with financial performance. Though slightly more profitable on average, farms managed by

191   university graduates with agricultural degrees (18% of the sample) were not statistically

192   significantly more profitable than those of non-university agricultural graduates ($p=0.18$).

193   This indicates that the formal agricultural qualification is important, not necessarily the level

194   of qualification achieved, although higher levels appear to be slightly advantageous.

195

196   Some 64% of respondents had some form of agricultural education beyond A Levels

197   (including degrees) and their businesses had 4% greater profit (or turnover) than those of

198   people with no formal agricultural education beyond A – level (t-test, p<0.001). It was found

199   that the least educated had a more negative view of discussion groups than their more

200   educated counterparts. Educational attainment was negatively correlated with viewing farm

201   walks and discussion groups as essential (rho = -0.29, p=0.01). These correlations support the

202   assertion that farm business profitability is associated with farmers' views on continuing

203   personal development.

204

205   Eleven on the 80 farmers reported paying-off loans early. Their businesses were significantly

206   less profitable than the others (t-test, p=0.04). Early loan repayment may be an unwise

207   alternative to on-farm investments if one assumes reasonable levels of finance costs. Nine of

208   the 80 respondents reported investing profits off-farm. These businesses tended to be more

209   profitable (t-test, p=0.07).

210

211   The most prominent variables that were not predictive of financial performance will now be

212   discussed. The literature review found that age, decision-making processes, and locus of

213   control were unlikely to be predictive of financial performance; this finding is supported by

214   the low non-significant correlations with profitability that are observed in this study. The

215   correlations did not approach the p-value of 0.05 or less significant threshold chosen for

216   presentation in this paper. For example, Locus of Control proved to be not correlated with

217   profitability with Spearman's rho of just 0.12 (p=0.30). No correlation was found between

218   hours worked and financial performance. The same was true for general self-rated

219   management ability on a scale of 1-10, indicating that effort in the form of hours worked and

220   general self-rated management ability are not predictive of financial performance.

221

222   All the questions in the questionnaire were assessed for associations with profitability and, if

223   they were not included in the above section on correlations with performance, or presented in

224   Table 4, they were not significantly associated with profitability at the $p< 0.05$ level.

225

226   *Multi-variate analysis*

227   To assess the relative importance of the variables correlated with farm profitability, multi-

228   variate linear regression was performed. The variables with the largest correlations with

229   financial performance (Table 4), were included in an initial model. Variables were

230   progressively eliminated, using a stepwise approach (Vandermersch and Mathijs, 2004),

231   based on variable p-values in the various models and the model AIC values. In this way,

232   variables were eliminated from the model until all remaining variables were significant.

233

234   The final model is presented in Table 5 and contains only five variables. The variable with

235   the largest univariate association with profitability, 'viewing increasing turnover as essential

236   to success', was discounted from the above process. This was because it was deemed likely to

237   have an endogenous relationship with the chosen dependent variable. Expressing ambition to

238   expand should, however, be considered a positive predictor of farm outcomes and was

239   associated positively - though not always at the $p<0.05$ threshold, with all 4 PBRC profit

240   variables. The associations were strong where turnover was the denominator. This finding

241   supports the interpretation that the chosen dependent variable's large association with this

242   variable, was partially spurious from the perspective of assessing manager performance, in

243   general.

244

245 Most of the model variables were independent of each other with the exception of variables 4

246 and 5 (rho=0.27, p=0.01). Both relate to emotions (pride and anger) in management. The less

247 profitable businesses tended to have managers who reported these emotions as being more

248 important.

249

250 During the model testing phase, all the variables were tested for interactions with each other

251 but they were found to be non-significant. The variance inflation factor calculated for the

252 model of 1.5 indicated multi-collinearity was not a major concern. A QQplot of the model

253 residuals indicated the Independent Variables are fairly normally distributed. This indicates

254 that a linear regression model was appropriate in this context. The R^2 value of 0.34 for the

255 model indicates that 34% of the variation in the profit measure was explained or predicted by

256 the responses to these five questions. However, as cross validation was not performed, it is

257 likely that this model is somewhat over-fitted. Validation of these findings in novel samples

258 of farmers would, therefore, be advantageous.

259

260 The same variables were included in models of each of the three other PBRC profitability

261 measures with 29%, 31% and 29% of the variation explained for PBRC, PBRC/turnover and

262 PBRC plus wages respectively (see Table 6). Large changes in profit were also predicted for

263 the three other measures for variation in all five question responses (variables). For example,

264 £33,575 more PBRC is predicted for respondents' each point of agreement with the statement

265 that their farm business is completely profit-orientated on a five point scale. This variable is

266 the most predictive of profitability in the model based on standardised coefficients. The focus

267 on profit is, presumably, primarily at the discretion of the manager but it could be partially

268 endogenous with less profitable farmers stating that they do not prioritise profit because they

269 know they are not very profitable. The second most important variable was the self-

11

270 assessment of management insight gained during their teenage years. This variable was found

271 to be negatively associated with profitability i.e. the more that respondents affirmed that they

272 learned 'a great deal' about farming during their teenage years, the lower the profitability of

273 their businesses. This variable and the remaining four model variables, are discussed in more

274 detail below.

275

276   **DISCUSSION**

277 The study reported here identified that certain farmer attitudes and, to a lesser extent,

278 behaviours, are associated with the profitability of their dairy farm businesses. The variables

279 included in the linear model were nearly all attitudes with only one behaviour being included:

280 'When things go wrong, I sometimes lose my cool and don't salvage the situation as well as

281 possible'.

282

283 Foremost amongst these was their agreement with the statement that their farm business is

284 profit-oriented. Those not agreeing with this statement strongly had much less profitable

285 businesses. As the sample used in this study were all engaging in a farm accounting service,

286 these figures are likely to be biased towards more profit-focused farmers and, as shown by

287 average herd size values, were biased towards larger enterprises. Many would also have been

288 engaging a farm consultant from the same company further highlighting a particular

289 commercial focus. This will likely also influence many other responses to the survey

290 questionnaire. However, the primary objective of the study was not to identify prevalence of

291 attitudes and behaviours in dairy farmers in GB, but to identify associations and patterns

292 likely to generalise to dairy farmers in other countries and, perhaps, non-dairy farmers.

293

294   Variable 2 and variable 3 of the linear regression model results related to participants'

295   attitudes towards self-learning and staff skills and knowledge respectively (Table 5). Those

296   who indicated that they gained a 'great deal' of management insight during their teenage

297   years were found to have less-profitable businesses. This was counter to the hypothesised

298   direction of association when the question was formed by the authors. As a post hoc

299   rationalisation of this finding, we assume that those who indicated that they learned a great

300   deal during their early teens, it is likely that they learned less in the period that followed.

301   Similarly, those that think novice staff do not require training and development had less

302   profitable businesses. Those who learned a great deal in their teens did not think novice staff

303   need training and appear to underestimate the value of training and skills. Together with the

304   correlations with training provision by the farm business and the educational attainment of

305   the farmers, and farm managers, themselves, this indicates a broader view towards continuing

306   personal development. This view most likely relates to having a'growth' or 'fixed' view of

307   human ability.

308

309   Having a growth mindset entails believing that 'people can change and develop their

310   behaviour over time, particularly when they devote a concerted effort to learn and apply more

311   effective strategies for task performance' and a fixed mindset entails believing 'personal

312   attributes constitute a largely stable entity that tends to not change much over time' (Heslin

313   and Vandewalle, 2008).

314

315   Two other statements that were posed were more directly related to a growth mindset. These

316   were: 'Management is a skill that can be honed and improved'; and 'Good managers are

317   born, not trained'. Responses to both questions did not correlate with profitability, perhaps

318   due to a social desirability bias influencing responses. Questions relating to training

319   provision, and perceptions of learning were, perhaps, not as impacted by a social desirability

320   bias as they indirectly relate to a growth mindset. Social desirability bias is where participants

321   do not respond accurately, intentionally or unintentionally, in order to maintain appearances,

322   and reduce the risk of embarrassment by answering how they think they should (Fischer,

323   1993). This could be a potential drawback of the self-reported based assessment of attitudes

324   and behaviour used in the study reported here. Nevertheless, this provides contrary evidence

325   to our assertion that a farmer's growth mindset, and view of continuing personal

326   development, are associated with profitability. In aggregate, however, it appears clear that

327   the growth mindset and, in particular, viewing continuing personal development as being

328   valuable is important.

329

330   Interventions to increase a growth mindset have been shown to affect self-rated performance

331   in some contexts (Visser, 2013). In addition, Heslin and Vandewalle (2008) illustrated that a

332   growth mindset can be created among managers and that the effects were durable. In their

333   study, increased growth mindset remained 6 weeks after the intervention. Therefore, it is

334   possible that farmers and farm managers with a fixed mindset could, thus, be coached to have

335   more of a growth mindset and so, potentially, improve the financial performance of their farm

336   businesses.

337

338   A growth mindset has been shown to be important in several contexts (Heslin and

339   Vandewalle, 2011). However, the study discussed here is one of the first to find that

340   profitability is associated with a manager's growth mindset related variables. The current

341   findings, thus, have potential significance outside agriculture (Heslin and Vandewalle, 2008;

342   Mischel, 2014).

343

344   Variable 4 examined if participants viewed cow comfort as a source of pride, and agreement

345   was negatively associated with profitability. This was counter to the hypothesised direction of

346   association when the question was designed by the authors. One potential interpretation is

347   that more profitable managers view cow comfort as assumed, not an achievement to take

348   pride in. This interpretation is consistent with the findings of Vandermersch and Mathijs

349   (2004) and Braun (2012).

350

351   Finally, variable 5 of the linear regression model relates to behaviour in a specific

352   circumstance which is indicative of personality and temperament. How a farmer reported

353   responding when things go wrong and, if they have a tendency to 'lose their cool' was

354   associated with profitability. Those that indicated they did 'not always salvage situations' and

355   who sometimes 'lose their cool' were found to manage less profitable businesses. Variables 4

356   and 5 indicate that rational, emotionally stable, and conscientious, farmers are likely to have

357   more profitable farm businesses.

358

359   Not included in the linear regression model, but highlighted in the univariate analysis, was

360   the strong association between an agricultural education and profitability and the lack of an

361   association with self-rated ability. Education was generally positive, and Läpple et al. (2013)

362   found that those with the least education were the ones most likely to benefit from discussion

363   group participation. However, those with less education were found to have a more negative

364   view of the usefulness of discussion groups in this study.

365

366   The fact that farmers' self-assessment of their own ability was not correlated with outcomes

367   was somewhat surprising given the results reported by Nuthall (2010) where a strong

368   relationship was found. In that study, however, farmers were asked to rate their ability in five

369   specific areas and the study reported here only asked for a more general self-assessment of

370   ability. Self-assessment is, thus, likely to be associated with performance as long as the

371   measure is sufficiently detailed and granular.

372

373   **CONCLUSIONS AND IMPLICATIONS**

374

375   The importance of farmer attributes in predicting farm profitability has been affirmed again

376   here with a large and significant proportion of variation in farm profitability predicted

377   independent of technical variables such as scale, land type and region. In addition, the

378   findings are coherent and offer practical insights to farm management which are, mostly, not

379   counter to expectations. However, the scale of the associations found is, perhaps, larger than

380   might have been expected.

381

382   In the study reported here, certain attitudes of farmers and farm managers and, to a lesser

383   extent, behaviours were found to predict farm profitability. These were, in descending order

384   of importance: having a profit objective; having a growth mindset; and indicators of

385   conscientiousness and emotional stability. Several other variables were also correlated with

386   farm business profitability, but did not warrant inclusion in a final multivariate regression

387   model examining other variables.

388

389   Our findings will be of significant value to four stakeholder groups. These are: future and

390   current dairy farmers; farm advisors and educators; recruiters of dairy farm managers; and,

391   third-party investors in farm land and businesses such as banks. The research presented here

392   can, perhaps, have a more immediate impact in an educational context. For example,

393   agricultural courses could include a focus on the topics identified. Students could complete

394   assessments that estimate how they would perform as farm managers based on their

395   responses to the questions reported here associated with profitability. Similarly, farm advisors

396   could identify where farmers' attitudes and behaviours differ from those most associated with

397   farm business profitability and assess if changes would be appropriate.

398

399   Recruiters of farm staff, and farm managers, could assess candidates' attitudes to see how

400   consistent they are with those found here most associated with profitable farming. With large

401   applicant pools, an algorithm could help filter applicants and guide close final decisions.

402   Potential farm land investors, or creditors, could also gain insight into the prospects of dairy

403   farmers with a similar approach.

404

405   This study only looked at dairy farmers in GB; repeating the study for farmers with other

406   types of enterprises and from other countries would be of value. Including other farmer

407   attributes such as personality and general cognitive ability is also likely to increase the

408   proportion of variation in outcomes explained significantly.

409

410   Farmers have a central role in the delivery of food security, environmental management and

411   the wider rural economy. Thus, it is no longer tenable that research into farm profitability

412   generally treats farmers as a 'black box' to be worked around. All promising avenues to

413   improve farm performance should be pursued. Developing, and managing, farm managers

414   with insights, such as those outlined here, could be an effective and relatively inexpensive

415   way to increase agricultural sustainability. Given the large effects observed in the study

416   reported here, it might, in fact, also offer significant rates of return on such investment.

417

418   **ACKNOWLEDGEMENT**

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424

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515 **Table 1.** A summary of the attitudes and objectives found to be associated with farm

516 profitability derived from a literature review.

Source	Finding and size of effect	Sample
Barnes (2006)	Multifunctional attitude associated with technical efficiency (β 0.02).	61 dairy farmers in Scotland
Hansson (2008)	'Idea of profitability' 0.09 and 'Expected profitability' 0.03 to long-term economic efficiency (Regression coefficients).	507 dairy farmers in Sweden
Herrmann (2016)	Farmers that prioritised their career and were committed to increased owner equity over three years. r=0.39.	51 mixed farms in E Germany
Mäkinen (2013)	Management thinking (MT) composed of 5 factors based on 28 questions predicted operating margin (β 0.59). The factors loadings on MT included entrepreneurial orientation (0.58), strategic thinking (0.55) and intrinsic values (0.44).	117 dairy farmers in Finland
Manevska-tasevska and Hansson (2011)	Profit maximisation 0.14 to 0.21, increasing production 0.14 to 0.1 and standard of living objectives 0.09 to 0.14 for technical efficiency.	301 grape growers in FYR Macedonia
Nuthall (2010)	Self-rated ability model β 0.49 - 0.51 to financial performance, objective of risk reducer (β 0.13) and profiteer (-0.07).	657 farmers in New Zealand
Thomas and Thigpen (1996)	Opposition to regulations and environmental rules were associated with higher gross income. Participation in such programs associated with opposition.	1,063 arable farmers in Texas
Vandermersch and Mathijs (2004)	Prioritising reducing inputs and costs: higher gross margin (model partial R^2 = 0.12). Focus on pedigree and yields negative (partial R^2 0.05). Model R^2 0.21.	79 farmers in Flanders
Wilson et al. (2001)	Maintaining the environment (0.019) and maximising profits (0.017) in the top 2 of priorities. Prioritising the two would predict approximately 4% greater efficiency.	73 wheat farmers in E England
Wilson et al. (2012)	High performing farmers characterised by attention to detail, focus on margins and cost control as being important.	24 farmers in England

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22

519   **Table 2**. Summary statistics of the survey sample.

	Mean values	Standard deviation
Age of participant	50.5	9.2
Number of milking cows	198	110
Yield per cow (L)	7,595	1,210
PBRC[1] (£)	153,459	89,800
PBRC[1] + wages (£)	216,050	114,501
PBRC[1] / turnover (%)	22	8
(PBRC[1] + wages) / turnover (%)	31	7.6

520

521   [1] Profit Before Resource Costs.

522   **Table 3.** Correlation matrix of the profit measures examined. (Pearson's r).

	PBRC	PBRC + wages	PBRC/ turnover	(PBRC + wages) / turnover
PBRC[1]	1.00	0.93	0.65	0.62
PBRC [1]+ wages	0.93	1.00	0.43	0.58
PBRC[1]/ turnover	0.65	0.43	1.00	0.81
(PBRC[1] + wages) / turnover	0.62	0.58	0.81	1.00

523

524   [1] Profit Before Resource Costs.

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Table 4. Correlations of variables with (PBRC[1] + wages) / turnover. N=80.

	Variable[2]	rho	p	Relationship	Mean[3]	Median	Std Dev	Comment/Interpretation
1	Increasing turnover is essential for long term success	0.367	0.001	Negative	2.5	2.0	1.1	High scorers will have efficient well run farms and so be best placed to consider expansions.
2	When things go wrong I sometimes lose my cool and don't salvage the situation as well as possible*	0.324	0.003	Negative	3.4	4.0	1.3	Indicative of emotional stability.
3	Content cows are a major source of pride*	0.308	0.005	Negative	1.7	2.0	0.8	Perhaps better farmers take cow comfort as a given.
4	I buy most of my inputs from 1 or 2 local suppliers	0.300	0.007	Negative	3.5	4.0	1.4	There was a broad distribution in responses to this question.
5	Training provision to staff	0.290	0.009	Positive	0.8	1.0	0.8	Count of training provided, off farm, on farm, other. (0-2)
6	I don't usually pay for staff training as they may leave after and/or I would rather do it myself	0.285	0.010	Negative	3.4	3.0	1.2	Related to item 5 and 12. Indicating of a cynical outlook and poor people management skills.
7	I worry about milk price a lot	0.282	0.011	Negative	2.9	3.0	1.1	
8	Age leaving full time education	0.261	0.019	Positive	18.0	18.0	2.6	Less predictive than item 13, level of education attainment.
9	People think I work too hard	0.247	0.027	Negative	2.1	2.0	1.1	Most participants agreed with this statement.
10	How important is the trait milk yield when selecting replacement genetics?	0.233	0.038	Negative	3.2	3.0	1.7	Broad range of responses received.
11	How much insight into farm management did you gain between 11 and 15 years old*	0.221	0.049	Negative	3.6	4.0	1.4	Agreement may indicate aversion to learning new methods and techniques.
12	Staff entering the industry lack important skills and knowledge*	0.220	0.050	Positive	2.8	3.0	1.1	See item 5 and 6. Appreciating that new staff need training is associated with profitability.
13	Level of educational attainment of manager	0.209	0.063	Positive	2.2	2.0	1.7	Scale 0- 5. 5= University level education
14	My farm is completely orientated towards maximising profit*	0.190	0.091	Positive	2.5	2.0	1.0	Most farmers did not agree strongly with this statement.

[1] Profit Before Resource Costs.

[2] Variables included in linear regression model shown in Table 5 are marked (*).

[3] Apart from variables 5, 8 and 13, the mean refers to agreement with the statements on a scale where 1 = agree strongly with the statement and 5 = disagree strongly with the statement. For variable 10, the mean refers to agreement with the statement on a scale where 1 = very important and 5 = not very important.

1   **Table 5.** Linear regression model explaining $(PBRC^1 + wages) / turnover$ $R^2 = 0.34$ (Adj =

2   0.30). The co-efficient can be interpreted as the % change in profitability associated with a

3   one point change in the independent variable (question response).

Variable	β	Co-efficient (%)	Std. Error	T-value	p - Value
Intercept		0.25	0.04	6.53	0.00
1 My farm is completely orientated towards maximising profit	-0.33	-0.02	0.01	-2.17	0.03
2 How much insight into farm management did you gain between the ages of 11 and 15	0.27	0.01	0.01	2.56	0.01
3 Staff entering the industry lack important skills and knowledge	-0.27	-0.02	0.01	-2.89	0.01
4 Content cows are a major source of pride	0.27	0.03	0.01	2.68	0.01
5 When things go wrong I sometimes lose my cool and don't salvage the situation as well as possible	0.24	0.02	0.01	3.09	0.00

4   β = Standardised co-efficient.

5   [1] Profit Before Resource Costs.

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8 **Table 6**. Change in profit measure predicted for each positive change in rank score for the

9 five regression variables.

	Variable statement	PBRC[1] (£)	PBRC[1] (%) / turnover	PBRC[1] + wages (£)
	Intercept	153,014	17.8	204,290
1	My farm is completely orientated towards maximising profit	33,575	2.5	32,433
2	How much insight into farm management did you gain between the ages of 11 and 15	-15,585	-1.5	-16,423
3	Staff entering the industry lack important skills and knowledge	17,759	1.4	24,701
4	Content cows are a major source of pride	-25,632	-2	-36,695
5	When things go wrong I sometimes lose my cool and don't salvage the situation as well as possible	-9,929	-1.7	-11,766
	Model R^2	0.29	0.31	0.29

10

11 [1] Profit Before Resource Costs.

12
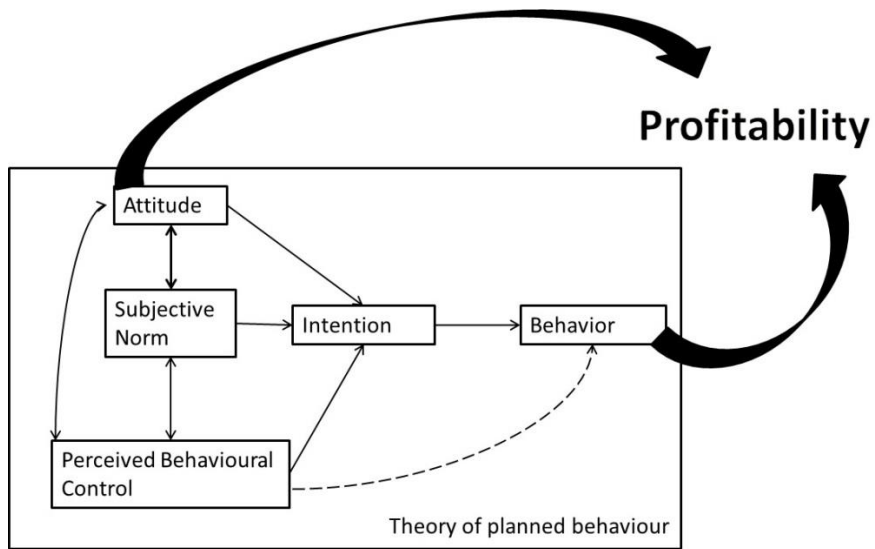
Fig. 1. Diagram of the Theory of Planned Behaviour adapted to illustrate the focus of this

study with the two thick dark arrows pointing to profitability.

Source: after Ajzen (1991).

18   Appendix. Illustration of accounts summary showing how Profit Before Resource Costs

19   and Profit are calculated.

FARM BUSINESS TRADING SUMMARY	
	31-Dec-13
	£
Livestock	608,856
Crops	6,250
Forage	380
Commercial	0
Sundry	26,662
BUSINESS TURNOVER	**642,148**
Livestock	190,726
Crops	4,785
Forage	37,654
Commercial	0
Sundry	0
Less VARIABLE COSTS	**233,165**
Livestock	418,130
Crops	1,465
Forage	-37,274
Commercial	0
Sundry	26,662
Equals BUSINESS GROSS MARGIN	**408,983**
Wages	51,136
Power and Machinery	93,366
Administration	23,241
Property Charges	28,047
Less DIRECT OVERHEAD COSTS	**195,790**
Equals PROFIT BEFORE RESOURCE COSTS	**213,193**
Land Rent	10,975
Quota Leasing	0
Machinery, Fixtures Investment Depreciation	37,016
Finance Charges (incl interest and charges)	21,207
Less TOTAL RESOURCE COSTS (incl depreciation)	**69,198**
Equals PROFIT	**143,995**

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