

FARMER PERSONALITY AND FARM PROFITABILITY

Subtheme: Labour Force of the Future

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Abstract

Personality has been shown to predict performance in many fields but in agriculture, the relationship has not been studied in detail. In the current study, 59 dairy farm managers in England and Wales completed psychological assessments. On 40 of 53 measures, farmers were found to be distinct from a general working population norm. Significant correlations to profitability for four measures are reported. Almost 40% of variation in farm profitability was predicted by a simple linear model with just three personality measures. 'Detail Conscious' and 'Leadership' measures positively and 'Relaxed' negatively predicted profitability. Improvements to farm profitability may be attainable by measuring and managing these three measures in farm managers' and staff.

Keywords: Profitability, Personality, Management, Talent, Performance, Psychology

1. Introduction

That farm managers' personality influences farm performance has been alluded to but rarely studied (Austin *et al.*, 2001; Nuthall, 1999). The full extent of personality's impact on farm profitability is therefore unknown (Austin *et al.*, 2001; Hansson, 2008; Nuthall, 2010). Meta analyses are reported in other sectors where personality and intelligence predicts more than 40% of the variation of job performance (O'Boyle *et al.*, 2010). Managing the personality of managers and staff on farm may therefore be a fertile avenue for significantly improving agricultural profitability that is currently not part of the farm management paradigm.

2. Materials and Methods

The objective of this study is to assess the relationship between personality and farm profitability. A sample of dairy farmers in England and Wales had their personality assessed in conjunction with the financial performance of their farm businesses. In this

section, the participant's characteristics, the profitability measure, the personality assessment, and the analysis methods used are introduced and described.

2.1 Sample characteristics

Over 180 dairy farm managers in England and Wales were asked to take part in the study. Most were clients of Promar International and a minority were contacted by DairyCo, as such, the sample frame can be classed as a convenience sample. 59 dairy farm managers completed a personality assessment and an acceptable response rate of 33% was achieved. Workload was cited as the most common reason for not participating. Financial data was not forthcoming from three participants however. Personality and financial data was thus available for only 56 of the 59 participants.

4.2.2 Profitability data

40 (out of 59) respondents had independently created farm management accounts created by Promar International who provided the financial data for this study directly. Looking at this sub sample of 40 in particular, it is not especially representative of England and Wales for farm size and system with smaller herds underrepresented in particular (Table 1).

Table 1 Participant farm businesses summary statistics (N=40, Promar data)

	Mean	Standard deviation
Herd size	210	108
CFP/ Litre	5.3p	5p
CFP/ Cow	£390	£353
Litres per cow	7,362	1,620

16 farm managers completed spreadsheets by themselves to calculate their own 'comparable profit' (AHDB, 2016). However, the farmer calculated data was suspected to be less accurate than the independently calculated data as stronger statistical relationships emerged when using only the independently calculated profitability measures. The 16 farm managers that contributed their financial data directly therefore appear to have not calculated their profitability very reliably or consistently. For this reason, this data was not included in

the profitability analysis resulting in a sample of just 40 for the correlation and linear model analysis. For comparisons between farm managers and the population norm, all 59 completed assessments were used.

2.2 Occupational Personality Questionnaire

Occupational Personality Questionnaire TM (OPQ) is a personality inventory designed for use in occupational contexts for selection and training. It is based on prominent models from psychology and management (Saville *et al.*, 1996). The OPQr version employed in this study takes 25 to 45 minutes to complete. It has a short, forced choice format with normative properties (British Psychological Society, 2016). The OPQ has received an endorsement from the British Psychological Society having been tested for validity and reliability (Smith and Banerji, 2007). OPQ's incremental validity for predicting performance beyond ability measures has also been established (Bartram, 2013; Furnham *et al.*, 2014). The OPQr was thus a suitable tool for the current study where farmer personality is the topic of interest.

Table 2 Example OPQ forced choice question block.

	Most like me	Least like me
I like helping people	X	
I enjoy competitive activities		
I view things positively		X

Table 2 shows an example OPQr question block. In each block, three statements were presented. Participants then selected the statement most like them and the statement least like them - a forced choice format. The forced choice format helps counteract social desirability bias and is relatively efficient (Brown and Bartram, 2009). As they are mostly self-explanatory and the OPQr instrument is proprietary, descriptions and definitions of every variable assessed is not included in this paper. Much of this information is, however, available from SHL/ CEB publications on their website published literature - e.g (Bartram, 2013; Brown and Bartram, 2009; Saville *et al.*, 1996).

2.3 Norm population

To calculate scores on these personality measures for participant farmers', their responses were compared by SHL to a norm population that was a representative general working population of UK English speaking countries. This includes people from India and Australia for example (SHL Group Limited, 2011). People from all socio-economic, educational and occupational backgrounds were included in this norm population.

'The OPQ32r international 'general population norm' is a work population norm, drawn from country-specific (or regional) work population norms (CEB, 2011-2012) that include people actively seeking employment and those in employment; it is therefore a generic norm of people who can be employed, including people not currently in employment, students, and graduates (with varying employment length and all education levels)'. (SHL Group Limited, 2015)

The characteristics of the norm population are detailed in the technical manuals available online from SHL/CEB website (SHL Group Limited, 2015). The main population norm characteristics of note that contrast with average dairy farmers in the England and Wales are as follows:

- A gender ratio of 61:39 male to female. Farmers in England and Wales are 95% male (Wilson *et al.*, 2013);
- 37% of the norm population were 29 or younger. Only 6.7% of the norm group were over the age of 50, while the average age of dairy farmers is 51 (Farm Business Survey Team, 2012);
- 32.6% of the norm population had postgraduate degrees, much higher than farmers at about 3% (Wilson *et al.*, 2013); and,
- Only 40% of the norm population had managerial responsibilities compared to all the participants of this study.

Though this may not be an ideal comparison, other population norm comparisons were not available for this study. For example, a comparison to managers or sole proprietors may have been more appropriate. Socio-demographic data about participants in the current study was not collected.

Table 2 Likelihood of having a particular competence by STEN score.

STEN Score	1	2	3	4	5	6	7	8	9	10
Competence likelihood	Unlikely		Less likely		Average		Quite Likely		Very Likely	

53 psychological variables were extracted from individual farm managers' assessments. These measures were calculated by SHL against the norm population and presented as STEN (standardised ten) scores in reports for the participants (Table 3). Each score indicates how likely the respondent has a particular competence / trait compared to the norm population. Mean STEN scores for the norm population are by definition 5.5 and have a standard deviation of 2 for the norm population (Macnab et al., 2005). These STEN scores were extracted from the individual participant's reports and are the independent variables in this study.

2.4 Analysis methods

To compare the participant's scores with the population norm mean of 5.5, one-sample t-tests were performed using R function 't.test' specifying 'two-sided' and mu of 5.5 (R Core Team, 2013). To assess the relationship between personality measures and profitability, Spearman's rank correlation analysis was performed. To assess the relative importance of variables correlated to profitability, linear regression was also performed. The 'cor' and 'lm' functions in R statistical software were used (R Core Team, 2013).

3. Results

Table 3 One sample t test, farm managers compared to population norm, two tails, n=59.* (1/2)

	Farmer Mean	Farmer Std Dev	p-value
Conscientiousness	3.4	2	<0.001
Detail Conscious	3.6	1.9	<0.001
Conscientious	3.6	2.1	<0.001
Service Orientation	3.8	1.8	<0.001
Building Bonds	4	2.1	<0.001
Achieving	4	1.8	<0.001
Rule Following	4.1	1.9	<0.001
Behavioural	4.2	1.9	<0.001
Understanding Others	4.3	2.1	<0.001
Persuasive	4.3	1.6	<0.001
Caring	4.3	2.1	<0.001
Emotional Awareness	4.4	2.1	<0.001
Communication	4.4	2.1	<0.001
Innovative	4.4	1.8	<0.001
Accurate Self Assessment	4.5	1.8	<0.001
Achievement Drive	4.5	1.8	<0.001
Organisational Awareness	4.5	2.1	0.001
Persistence	4.6	2.2	0.003
Influence	4.6	1.9	0.001
Change Catalyst	4.6	2.1	0.002
Developing Others	4.6	2	0.001
Teamwork and Collaboration	4.6	1.9	<0.001
Leadership	4.7	2.1	0.005
Affiliative	4.7	2.1	0.003
Socially Confident	4.7	2	0.003
Democratic	4.7	2.5	0.015

* Being STEN scores, the reference population has a mean of 5.5. Ordered by mean STEN score.

Table 4 One sample t test, farm managers compared to population norm, two tails, n=59.* (2/2)

	Farmer Mean	Farmer Std Dev	p-value
Democratic	4.7	2.5	0.015
Evaluative	4.7	1.9	0.002
Conceptual	4.7	2.2	0.011
Variety Seeking	4.7	2.1	0.006
Adaptable	4.7	1.7	0.001
Initiative	4.8	2	0.009
Outspoken	4.8	2.1	0.017
Self Confidence	5	1.9	0.045
Data Rational	5	2	0.049
Conflict Management	5.1	1.7	0.083
Controlling	5.1	1.9	0.148
Outgoing	5.2	2.1	0.34
Optimistic	5.3	2.1	0.55
Decisive	5.3	2.1	0.41
Adaptability	5.4	2	0.675
Relaxed	5.4	2.5	0.732
Competitive	5.5	2	0.869
Forward Thinking	5.6	1.8	0.694
Tough Minded	5.7	2.3	0.515
Trusting	5.7	2	0.423
Vigorous	5.8	1.8	0.265
Conventional	5.9	2	0.105
Worrying	6	1.9	0.059
Self Control	6.1	2.1	0.024
Consistency	6.2	1.4	<0.001
Modest	6.5	1.9	<0.001
Emotionally Controlled	7	2.2	<0.001
Independent Minded	7.2	1.7	<0.001

* Being STEN scores, the reference population has a mean of 5.5. Ordered by mean STEN score.

In this section, the results of three types of analysis are presented. First, the scores of farm managers are compared with the reference norm sample using one-sample t-tests. Secondly, correlation analyses between personality measure STEN scores and profitability measures are reported. Finally, two linear models predicting profitability are presented.

3.1 Comparison with norm population

As the OPQ reports measures as standardised ten (STEN) scores, for comparison purposes, the mean of the norm population described in Section 2.3 for each measure is by definition 5.5. Table 4 and Table 5 report the contrasting mean scores for farm managers, the standard deviation of farmer sample, and the p-value indicating if farmers scores were statistically distinct from the norm population (UK English speaking general working population). For 40 of the 53 measures, the farm managers' scores differed significantly. For example, farm managers scored lower on Conscientiousness and Detail Conscious measures but higher on Modest and Independently Minded compared to the norm sample.

3.2 Correlations to profitability (n=40)

Four variables had large and significant correlations to both profit per cow and profit per litre (Table 5).

Table 5 Profit and personality correlation (n=40)

	Rho	p-value	Rho	p-value
	profit/litre		profit/cow	
Detail Conscious	0.48	0.00	0.45	0.00
Leadership	0.46	0.00	0.43	0.01
Relaxed	-0.35	0.03	-0.37	0.02
Conscientiousness	0.35	0.03	0.33	0.04
Controlling	0.30	0.06	0.29	0.07
Democratic	0.29	0.07	0.26	0.11
Social Skills	0.29	0.07	0.24	0.14
Conscientious	0.26	0.10	0.26	0.10
Self-Control	-0.21	0.19	-0.29	0.07

3.3 Profitability linear models

This study set out to identify variables predictive of Comparable Farm Profit (CFP) per cow and per litre. To this end, linear models to predict variation in these two variables were developed using the personality measures correlated to these profitability measures. An initial model was created with the nine variables most correlated to profitability (Table 6).

The least significant variable was then removed and the model re-run. This procedure iterated until all the variables were statistically significant, similar to the stepwise procedure used by Vandermersch and Mathijis (2004). Models with an adjusted R^2 of 1.41 for the profit per litre and 0.38 for the profit per cow resulted. The same three variables emerged in predicting both outcomes; Detail Conscious, Leadership and Relaxed (Table 7 and Table 8).

A high scorer for Detail Conscious 'focuses on detail, likes being methodical, organised and systematic'. A low scorer is likely to be described as 'unlikely to become preoccupied with detail, less organised and systematic, dislikes tasks involving detail'. High scorers were much more profitable. Scoring one STEN score higher on this measure (half a standard deviation) was associated with £72 per cow or 1p per litre greater CFP per year.

Table 7 Profit / litre predicted by personality variables (N=40, $R^2=0.48$, Adj $R^2=0.41$)

	β	Estimate	Standard Error	t-value	Pr(> t)
(Intercept)		1.03p	2.16p	0.47	0.638
Detail Conscious	0.40	1.00p	0.31p	3.22	0.003
Leadership	0.34	0.79p	0.29p	2.72	0.001
Relaxed	-0.31	-0.61p	0.24p	-2.49	0.017

A similar change in Leadership score is modelled to result in a £55 per cow or 0.8p per litre change in profit per year. Leadership is described as 'Inspiring and guiding individuals and group. Leading by example and arousing enthusiasm for a shared vision.' Finally, Relaxed was negatively associated with profit with each STEN score increase associated with a negative change in profit of £-49 per cow and -0.6p. A high scorer on this is likely to be described as 'finds it easy to relax, rarely feels tense, generally calm and untroubled'. A low scorer 'tends to feel tense, finds it difficult to relax, can find it hard to unwind after work'.

Table 8 Profit / cow predicted by personality variables (N=40, R²=0.43, Adj R²=0.38)

	β	Estimate	Standard Error	t-value	Pr(> t)
(Intercept)		£137.66	0.477	-1.554	0.129
Detail Conscious	0.38	£71.84	0.069	2.994	0.005
Leadership	0.31	£54.67	0.064	2.449	0.019
Relaxed	-0.32	£-48.72	0.054	-2.596	0.014

Only the personality measures derived from the OPQ were included in this analysis, as that is the focus of the study. Other variables such as farm size or socio demographic characteristics might have been considered if available.

3.4 Findings summary

Three key findings from this study are:

- Dairy farm managers in England and Wales have distinct personalities from the norm population used in this study. Statistically significant differences in mean scores for 40 of the 53 personality measures support this conclusion;
- Four measures correlated strongly to farm profitability; Detail Conscious, Leadership, Relaxed and Conscientiousness; and,

- Detail Conscious, Leadership and Relaxed measures cumulatively predict approximately 40% of farm profitability in this sample as reported in the linear models presented.

4. Discussion

Farmers are distinct psychologically from the population norm of people available to work in UK English speaking countries with 40/53 variables being significantly different (Table 4 & Table 5). This was to be expected as farm managers are quite different in many regards from the general working population of UK English speaking countries used as population norm. Of note however is that, participants in general scored lower than the population norm used.

Farm managers scored a standard deviation lower on Detail Conscious (mean =3.6) compared with the norm population (5.5) described in Section 2.3. This indicates farm managers are much less likely to focus on detail, be methodical, organised and systematic compared the population norm and compared to many of the other measures assessed. Farmers are generally their own bosses, perhaps explaining this difference from the reference population who are generally employees. A comparison to managers in other sectors would have been insightful in this regard. Leadership was the other positively related variable and had a mean of 4.7, just less than half a standard deviation lower than the norm population.

Farmers were found to have a similar mean score for Relaxed to the norm population (5.4) and the measure was negatively associated with profitability. High scorers on Relaxed are likely to be less proactive in preventing problems as they can tolerate problems when they arise. The more anxious and worried manager, scoring lower in Self-Control and Relaxed, goes out of their way to prevent such occurrences.

The remainder of this discussion section discusses these findings in further detail. First, each of the three variables included in the profitability models are discussed and interpreted in detail (4.1 - 4.4). Observations regarding data sources, future research (4.5) and weaknesses of the current study (4.6) are then discussed.

4.1 Detail conscious

The Detail Conscious measure relates positively to profitability. A high scorer 'focuses on detail, likes being methodical, organised and systematic'. A low scorer is 'unlikely to

become preoccupied with detail, less organised and systematic, dislikes tasks involving detail'. The sample of dairy farmers assessed had relatively low scores compared to other competences assessed and the norm population used in this study. Half of farm managers had STEN scores of three or below. The median dairy farmer in the sample was thus at least a standard deviation less Detail Conscious than the norm population.

Potential explanations include that many farmers may only have worked for family members before becoming managers themselves and that family owned and managed farms provide job security that is likely to reduce incentives for Detail Conscious behaviour expected in other contexts. Further research, both quantitative and qualitative, may be required to understand this finding fully. However, farming does not preclude Detail Conscious behaviour as several high scorers were observed in this study (Figure 1). These farmers tended to be much more profitable.

The correlation of $\rho=0.48$ indicates that the Detail Conscious measure of farm managers co-varies with approximately 24% of the variation in profit. This is the largest correlation reported in this study. The regression model indicates that a change in STEN score of just one (half a standard deviation in the norm population) predicts a change in profit per cow of £71. Assuming a 150 cow herd, the UK average (Ashbridge, 2014), this implies over £10,000 profit differential a year for a single STEN point change in managers' scores. The relationship between Detail Conscious behaviour and profitability should be communicated to farm managers along with the finding that it is far from the norm in the industry.

Starting from a low base of 3.7 and with the largest single correlation observed in this study, this offers the greatest potential return for achieving farm performance improvements. If farm managers could become more Detail Conscious, large improvements to performance may follow. The models suggest that effecting a two or three point change in this score could have large benefits. Expending effort to achieve this is likely to represent a good return on investment for farmers.

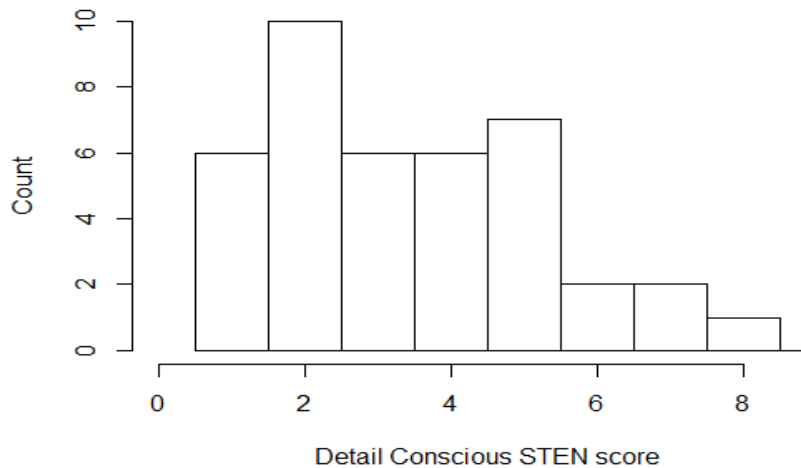


Figure 1 Detail Conscious distribution. Most farm managers in the sample scored below the mean of the reference norm sample, 5.5.

4.2 Conscientiousness and related measures

This section outlines the differences between Conscientiousness, Conscientious and Detail Conscientious measures discussed in this study. Conscientiousness is one of the five factors constituting the Five Factor Model (McCrae and Costa, 1985) also known as the Big Five or NEO five. The scores Conscientious and Detail Conscientious exist within the 'Conscientiousness' factorial space (Brown and Bartram, 2009). Conscientious and Detail Conscientious therefore measure specific aspects of 'Conscientiousness'.

The broader measure, Conscientiousness, is described as 'Taking responsibility for personal performance. Meeting commitments and adopting an organised approach to one's work.' This measure correlated to profit per litre and cow significantly (0.35 & 0.33). In contrast, a high scorer for Conscientious, an aspect of Conscientiousness, is described as someone who 'focuses on getting things finished, persists until the job is done' and low scorer as someone who 'sees deadlines as flexible, prepared to leave some tasks unfinished'. Conscientious correlated (0.26) to both profit measures but was not statistically significant ($p=0.10$).

Finally, a high Scorer on the Detail Conscientious measure is likely to be described as 'focuses on detail, likes to be methodical, organised and systematic, may become preoccupied with detail' while a low scorer is likely to be described as 'unlikely to become preoccupied with detail, less organised and systematic, dislikes tasks involving

detail'. The correlation to profit was the highest of all three measures ($\rho = 0.48$ & 0.45).

Among these three measures, it is getting things done correctly, being organised, systematic and detail focused (Detail Conscious) that is most predictive of profitability. This is followed by the broader measure of generally taking responsibility for achieving commitments (Conscientiousness). Dogged drive to complete tasks on time, but perhaps not to the highest standards, (Conscientious) is positive, but this effect size is marginal. With this nuanced understanding, targeted discussion and efforts can be delivered to farmers to help improve performance.

4.3 Leadership

Leadership is described as

'Inspiring and guiding individuals and group. Leading by example and arousing enthusiasm for a shared vision.'

The important role of Leadership in farm profitability is for the first time confirmed empirically among farm managers by these findings. The regression models predict that if two farmers only differed in their Leadership measure by one STEN score, half a standard deviation, the one that scored higher would achieve £55 more profit per cow or just under £8,000 more a year for a 150 cow herd.

4.4 Relaxed

The variable Relaxed had a large negative correlation to profitability and was included in the final models. A high scorer on the Relaxed measure 'finds it easy to relax, rarely feels tense, generally calm and untroubled' and a low scorer 'tends to feel tense, finds it difficult to relax, can find it hard to unwind after work'. A constant drive to succeed manifesting as tenseness and an always-on approach appears beneficial in dairy farming, financially at least. This finding was contradictory to expectations. Relaxed exists in the factorial space of Emotional Stability (Bartram, 2013) which is thought to be an important positive predictor of performance in general while these results indicate that some aspects of emotional stability are not beneficial from a farm financial perspective.

4.5 Data quality and future research

Future research should include the OPQr or alternative psychological inventory, a reputable GCA measure and quality financial data with a larger fully representative

sample and with different populations of farmers. Controlling for business size may also be advisable. The OPQR instrument has proven effective for use with farm managers. However, non-proprietary alternatives should be considered. The OPRs' opaqueness due to its proprietary nature is a significant impediment from a research perspective and it would be relatively expensive for farm managers to use the tool themselves and so is likely to reduce potential benefits from application of the findings in practical contexts.

5. Conclusions

Three personality measures predicted ~40% of the variation in farm financial performance in a relatively modest sample of 40 dairy farmers in England and Wales. A wide range of scores on these variables existed among farm managers and the mean scores of some key attributes are distinct from the norm population used in this study. Hiring and training of farm managers and staff is likely to be improved by increased assessment of such personality measures. Training providers and consultants to farm managers should consider how to achieve this.

Increasing Detail Conscious behaviour is the most pressing issue arising as there appears to be a systemic bias against this beneficial trait among dairy farmers in England and Wales. The effectiveness of training targeting Detail Conscious behaviour and Leadership at improving financial performance also requires investigation. Further research with larger, more representative and diverse samples of managers focusing on Detail Conscious, Leadership and Relaxed measures is required to verify the very promising findings of this study.

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