



The Impact of Education on Farm Performance

AN RBR STRATEGIC FUNDS PROJECT REPORT



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ASKHAM BRYAN COLLEGE

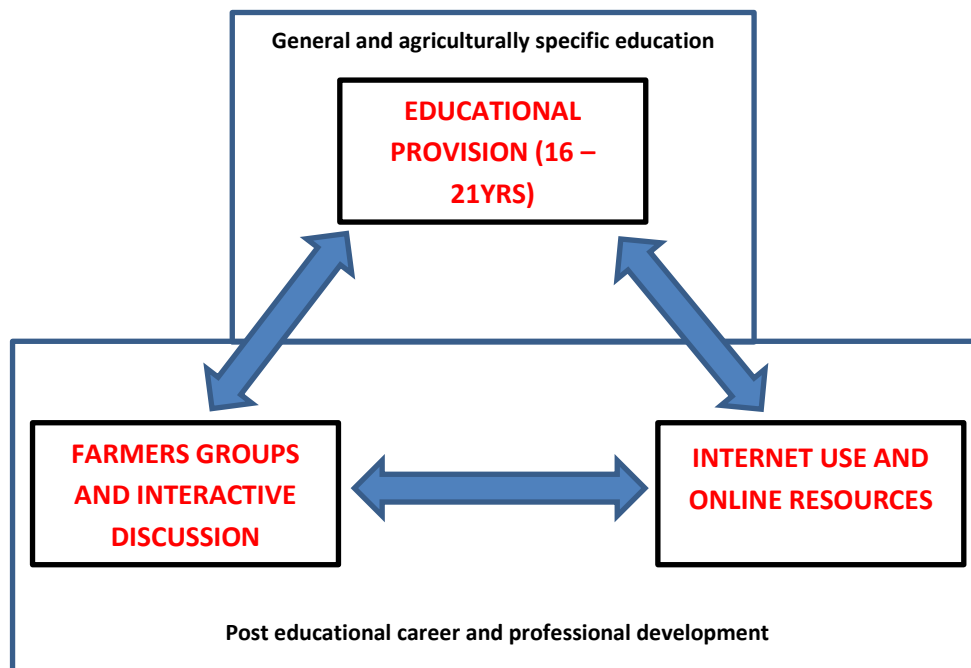
Acknowledgements

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SUMMARY AND RECOMMENDATIONS

Agriculturally specific education is essential for good farm performance. Moreover, the continual professional development of the knowledge and skills needed for modern farming practice is also essential. The modes of dissemination of this knowledge depends on farmers preferences; this links well with education theories regarding learning styles¹. However, the internet, discussion groups and farming press are all favoured methods of gaining knowledge. The diagram below shows how educational provision, interactive farmers' groups and online provision can be linked to provide a framework for agricultural education and career and professional development.



A conceptual framework for visualising the links between formal education and effective farming career and professional development

A detailed analysis of the quantitative data supplied by RBR indicates that agriculture-specific education can enable farmers to perform better in comparison with those without an agriculture-specific education. Moreover, farmer interviews revealed that farmers generally viewed their own education as having been useful to further their understanding of farm accounts, business and technical knowledge, however, when asked about education in general, farmers' perceptions of their own education is at best mixed and what is more, farmers generally view gaining the next level of education as having no benefit to them or their businesses.

Farmers value career and professional development (CPD). However, high performing farmers prefer to gain their knowledge through farmers groups, general farming publications, discussion with friends and colleagues and the internet. Farmers groups and the internet scored particularly

¹ Honey, P and Mumford, A. (April 2006). *The Learning Styles Helper's Guide*. Available at <https://www.talentlens.co.uk/assets/lsg/downloads/learning-styles-helpers-guide-quick-peek.pdf>. Accessed 24.4.2017

well amongst all groups of farmers as being valuable sources of information. The view of specific farming training events is ambiguous, with barriers to attending these events being prohibitive.

Those farmers interviewed, cited attitude and confidence as key attributes for individuals wishing to establish a successful farming business and although a high value is placed on knowledge and understanding, this is qualified as good quality knowledge and understanding to help farmers make informed decisions.

More work needs to be done to develop a better idea of what constitutes a firm foundation for agricultural education and in particular how this education links to post-educational farming careers and professional development. The use of the internet by farmers for improving farming practice needs to be investigated further and likewise for farmer discussion groups and an exploration of how these two modes of knowledge dissemination interact will be essential to maximise the impact of knowledge transfer initiatives.

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INTRODUCTION AND BACKGROUND

1.1 The purpose of education in UK agriculture

Education is almost universally regarded as a common good, necessary for social cohesion and to develop citizenship. It is also widely agreed that formal education and training are vital for development of the abilities, skills and knowledge needed for the work place². We readily accept that, in general, the income of individuals who undertake formal, organised education will be greater than that of those who do not, and the higher the level of education engaged in, the greater the income differential will be. Higher levels of education are indeed correlated with higher levels of income and wealth³. How exactly level of education and income are specifically connected needs to be explored carefully in all areas of employment and economic activity because correlation is not of course the same as causation, other possible explanations for the connection between education and income may exist. A person can take part in education and training because they are naturally inquisitive, or because they like a challenge and the sense of achievement which gaining a qualification gives - these may also be equally important reasons why they are able to gain more highly paid employment or be more successful in business, not just the fact that they have undertaken a specific education or training course to a particular level.

This study investigates the impact of education type and level on farm activities and profitability because it is very important, as a first step, to try and establish much more clearly what the link is. There is indeed a lack of published research on the connection between education and farming success, despite the acknowledgement that UK agriculture is a highly skilled, entrepreneurial industry that requires a sustainable input of trained people with the skills and expertise to manage the industry in the future⁴. UK farming is confronted with many challenges, including changing political, environmental and global pressures; to face these challenges it will need to become much more resilient. Profitability is a key element of resilience, how education type and level contributes to the longer term survival and prosperity of farming businesses has to be made much clearer.

The Green Food Project (2012)⁵ identified that the UK requires a successful, innovative and ambitious farming sector going forward, and to achieve this, it needs appropriately educated people entering the industry (DEFRA, 2012). Although the Green Food Project report suggests changes to the educational system regarding the inclusion of agriculture and land-related matters into the school curriculum, it fails to refer to wider agricultural education. Examination and clarification of what constitutes appropriate qualifications for

² Delors et al, 1996. Learning: The Treasure Within. Paris. UNESCO

³ Hawkes, D and Ugus, M. Evidence on the relationship between education, skills and economic growth in low income countries. A systematic review: EPPT Centre, Social Science Research Unit, Institute of Education.

⁴ Agriskills Forum (2010). Towards a new professionalism: the skills strategy for agriculture and horticulture

⁵ Defra, 2012. *The Green Food Project Conclusions*. Available at https://cereals.ahdb.org.uk/media/5434/GFP_Conclusions.pdf. Accessed 20.04.17

people entering farming in the UK is not evident. Studies have taken place, which indicate the potential benefits of agricultural education and training in other contexts. For example, Kilpatrick (2008)⁶ in an investigation in Australia which collected farm financial data and information about changes to farm-management practices, as well as information about education and training, concluded that education and training figure highly in farmers' ability and willingness to make successful changes to their management practices. Keelan *et al.* (2009)⁷ have shown that the agricultural education level of Irish farmers is a highly significant determinant of willingness to adopt new (GM) technology.

The long term survival and sustainability of family farms in the UK, whether owned or tenanted, depends on the ability and willingness to adapt to rapidly changing economic and environmental circumstances. To ensure UK Agriculture remains at the forefront of world food production the education of future farmers and those working in the industry is paramount, especially with the uptake of new technology and precision farming techniques the UK requires a sustainable number of suitably skilled workers to continue to drive the industry forward. Establishing the type and level of education which enables these workers to become suitably qualified has to be a priority.

1.2 The objectives of this investigation

In order to be able to determine the impact of education type and level on farm activities and profitability, this investigation set itself a number of research objectives which are described below;

- Identification of a large group of suitable farms encompassing a range of farm type, size and income.
- Identification of the level of education completed by the primary farmer on each of these farms i.e. from school through to post graduate study.
- Identification of the type education undertaken by the primary farmer (eg: GCSE's, Level 2 qualification, A levels, Apprenticeship, Higher Education etc.)
- Identification of the type of institute at which the primary farmer received their education.
- Evaluation of the links between education type and level of the primary farmer and:
 - o Farm success (profitability)
 - o Uptake of farm diversification enterprises

⁶ Kilpatrick, S. *Education and training: Impacts on farm management practice*. The Journal of Agricultural Extension, 7 (2), 105-116 .

⁷ Keelan, C., Thorne, F.S., Flanagan, P., Newman, C., & Mullins, E. (2009). *Predicted willingness of Irish farmers to adopt GM technology*. AgBioForum, 12, 394-403.

- o Uptake of new farming technologies
- o Engagement with environmental schemes

1.3 The data used for this investigation

1.3.1 Financial data

The group of farms identified for this study are within Yorkshire, Lancashire and Cheshire which have been sampled by the Rural Business Research Unit (RBRU) at Askham Bryan College for at least three years i.e. 2012/2013, 2013/2014 & 2014/2015. The Farm Business Survey (FBS) data from the financial year 2014/2015 have been used for this investigation. The size of this sample is 283 and includes Arable, Dairy, Hill and Lowland farms. Definitions of the financial terms used are provided at the end of this report.

1.3.2 Qualitative data

A small sub-sample of 15 farms from those in the survey was identified for further study. The farms included in this sample were chosen on the basis of performance rather than farm type, but did not include pig or poultry farms. Five of the farms were classified as high performing, five as medium performing and five as low performing, according to the farm business income (FBI) data provided by the RBRU.

In each case the primary farmer was interviewed face-to-face by a member of the RBRU staff during the winter months of 2016/17 using the questionnaire shown in Appendix 2. The interviews were semi structured and designed to gain the primary farmer's attitudinal views and approach to education, training and development, and their perceptions of any barriers to these.

The interview responses were amalgamated and placed into a word cloud generator⁸ to determine the frequency of words used in the responses. By identifying the most popular words used by the participants, the views and sentiments of the farmers interviewed can be discerned.

⁸ <https://www.jasondavies.com/wordcloud/>

FINDINGS AND ANALYSIS

2.1 Financial Background

An indication of the financial background to the farms surveyed has been gained from the data by examining the effect of farm type and farm size on net farm income.

Farm business income varies between farm business type. There are numerous factors that affect farm business success⁹ and this assessment is supported by the data shown in Figure 1.

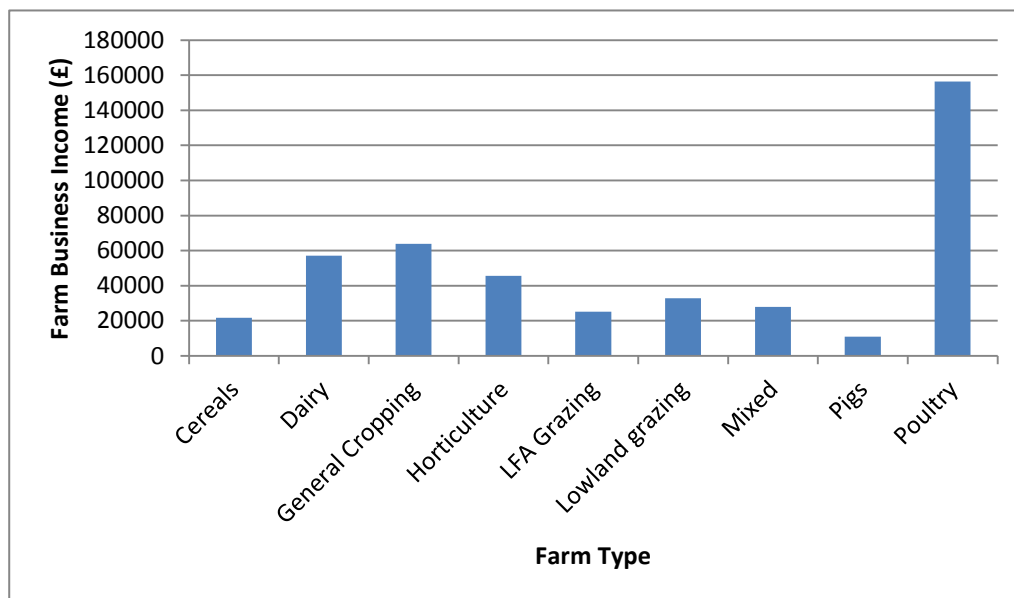


Figure 1. A bar chart to show the performance of different farm business types in terms of farm business income

It is also clear from Figure 1 that the poultry industry out-performs all other farm types in 2014/15, with all other types being less than half as profitable.

There is no strong relationship between farm size (in hectares) and profitability. When net farm income was compared to farm size, a slight negative correlation was seen ($R^2=5.8\%$). When farm business income was compared to farm size, again, a slight negative correlation was seen ($R^2=0.2\%$).

⁹ Wilson *et al.* (2013). Farm Level Performance: Identifying Common Factors Determining Levels of Performance. Rural Business Research Report

However, when the pig and poultry enterprises are excluded from the data the relationship between net farm income and the area farmed changes. The relationship between net farm income and total area farmed does not decline so markedly when pig and poultry farms are removed. Pig and poultry farms have a tendency to skew the data and the decision was taken, for the purposes of this study, to exclude these farms when deciding on which farms to visit for the face-to-face interviews.

2.2 Quantitative analysis

To discover if any link exists between educational status and farm business performance, the 2014/15 farm business data sourced from the FBS was used. The measures of business performance used were farm business income, net farm income and farm output.

Initial descriptive statistical analysis indicated that there is a difference in farm business income between farmers grouped by educational status (see Figure 2 below). According to Figure 2, farmers with national diploma or certificate, school only, degrees and 'other' qualifications out-perform farmers with post-graduate, GCSE or equivalent, A-level or equivalent and apprenticeship qualifications. This prompted further statistical analysis to be carried out. It is worth noting that only two farmers with post-graduate qualifications were included in the data set.

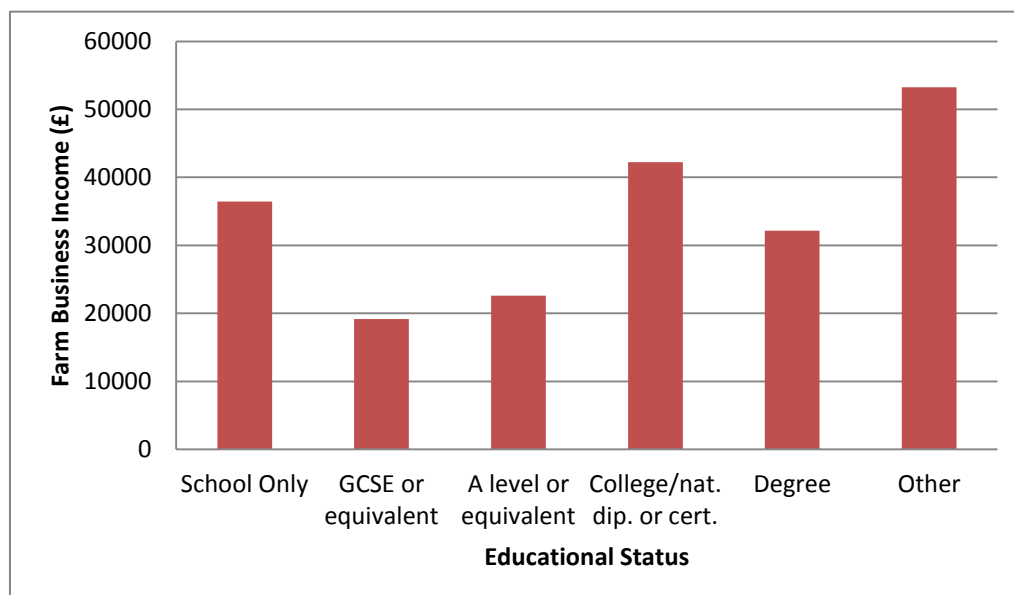


Figure 2. A bar chart to show the farm business income of farms managed or owned by farmers grouped by educational status.

NB. The educational status of farmers has been placed by the farm business survey into the categories of school only, GCSE or equivalent, A level or equivalent, national diploma or certificate, degree or other (the qualifications are not necessarily agriculture specific).

After conducting the Mann-Whitney U non-parametric statistical tests, no significant difference in farm business income was seen between any of the educational groups.

The educational status of primary farmer/decision maker was compared in terms of net farm income (see Figure 3 below). A severe decrease in performance of those farmers with GCSE or equivalent qualifications was seen when compared with farm business income data.

Otherwise, the pattern and relative standing of the other groups in Figure 3 is very similar to Figure 2. It is unclear as to why those educated to GCSE level-only would perform so poorly, relatively speaking, when using the net farm income metric.

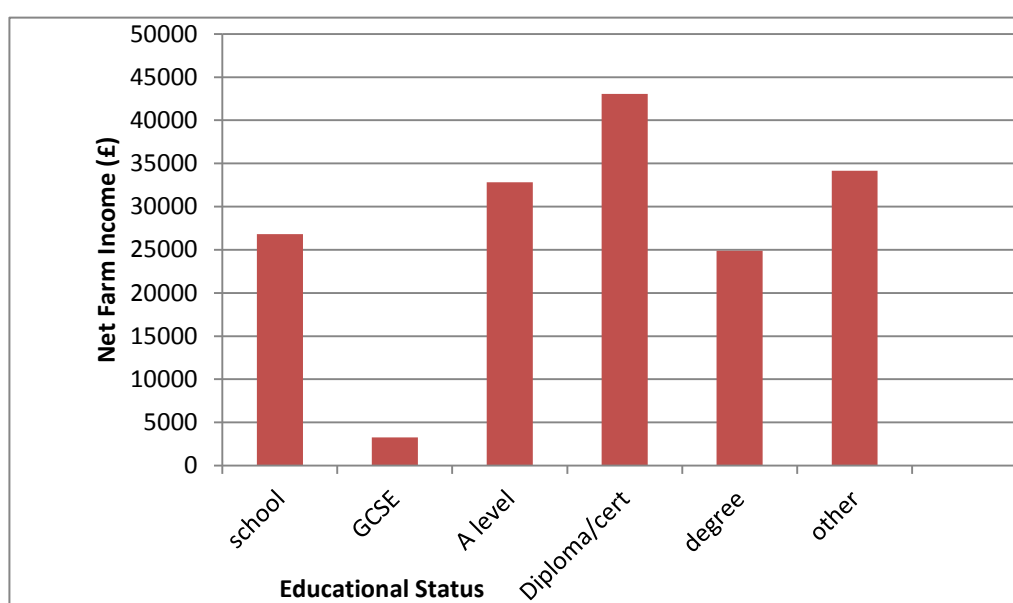


Figure 3 A bar chart to show the net farm income of farms managed or owned by farmers grouped by educational status.

The Mann-Whitney non-parametric statistical test was used to test for any significant differences in net farm income between educational groups. There is a statistically significant difference between the GCSE or equivalent educated group and the national diploma/certificate group (90% confidence interval; $W = 1246.0$; Test of $\eta_1 = \eta_2$ vs $\eta_1 \neq \eta_2$ is significant at 0.068). Using the net farm income data it is clear that those educated to national diploma/certificate level out-perform other groups and the GCSE or equivalent educated group to a statistically significant level. The national diploma/certificate qualifications tend to be agriculture specific.^{10, 11}

¹⁰ <http://qualifications.pearson.com/en/qualifications/btec-nationals/agriculture-2017.html>

Farm output data against educational status gave a slightly different outcome (see Figure 4 below). Those educated to GCSE level-only perform better using this metric indicating that the efficiency of these farms in terms of net income per unit output is less than those farms managed by farmers with a different educational status.

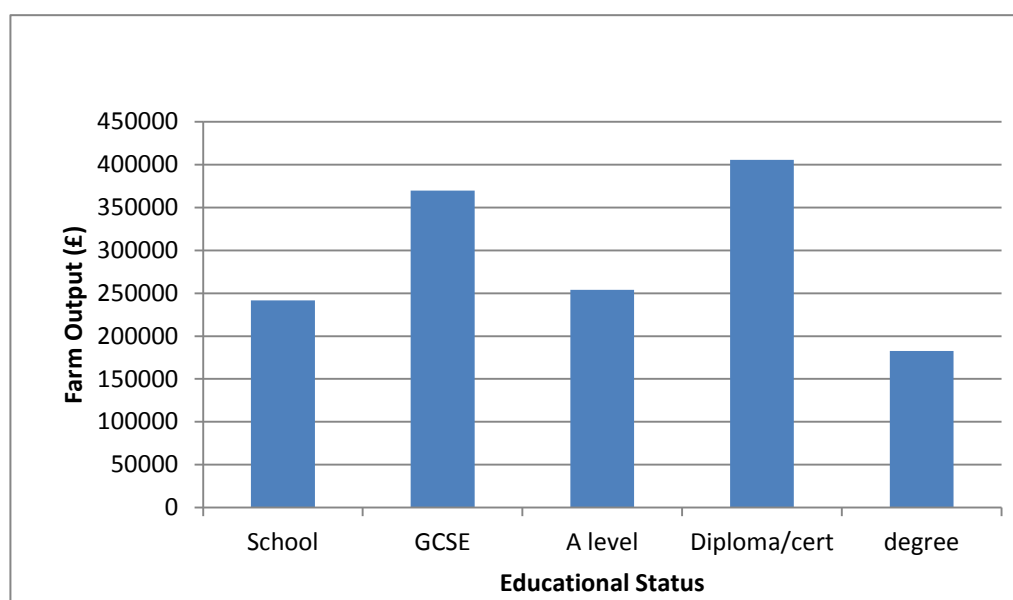


Figure 2 A bar chart showing the farm output of farms managed or owned by farmers grouped by educational status.

Once again the Mann-Whitney non-parametric statistical test was used to test for any significant differences in farm output between educational groups. There is a statistically significant difference between the school-only group and the national diploma/certificate group (95% confidence interval; $W = 12915$; Test of $\eta_1 = \eta_2$ vs $\eta_1 \neq \eta_2$ is significant at 0.043).

2.3 Qualitative analysis

As noted above, 15 farmers in total were interviewed by RBRU staff. Five were primary farmers on farms classified as high performing, five were primary farmers on farms classified as medium performing and five were primary farmers on farms classified as low performing. Table 1 below shows the level of education undertaken by the primary farmer/decision maker interviewed. It can be seen that in the high and medium performing categories 8 out of 10 of the farmers interviewed completed a level 3 or above (degree) level education in an agriculturally related subject. In the low performing category, 2 out of 5 of the farmers undertook a similar level and type of education.

Table 1. This table indicates the different types of education each of the fifteen farmers interviewed has undertaken.

Educational Status	HIGH PERFORMING	MEDIUM PERFORMING	LOW PERFORMING
School only			1
GCSEs or equivalent	1		
A-levels			
Agricultural College NC (level 2)	1		
Agricultural College ND (level 3)	2	3	1
Other College NC (level 2)			1
Other College ND (level 3)			
Degree (in agriculture/agriculturally related subject)	1	2	2
Other (additional qualifications)	1	2	1

Participants' views on how useful their further or higher education was to their farming practice are shown in Table 2 below. As can be seen, those participants categorised as high performers do not view their education as having been useful to them, with no farmers responding to the question with 'a lot' or 'it has been essential'. However, both medium and low performing farms place a much higher value on their education. The participants were also asked to expand on this initial response and indicate where possible how their education experience has helped their farming careers. A word cloud (see Figure 5) was devised from their responses.

Table 2. The perceptions of farmers participating in the study of their own education in terms of how it has helped them farm is shown in this table.

How much do you think your college/university course helped in your working life in farming?	HIGH PERFORMER	MEDIUM PERFORMER	LOW PERFORMER
Not at all	2		
A little	2		
Quite a lot	1	2	2
A lot			
It has been essential		3	2

'In hindsight yes - in today's society you need qualifications to do everything eg. Spraying- actually courses seem to cater for farming needs eg. rat poison etc. qualified operator.'

Many participants are involved in maintaining a knowledge base and keeping up-to-date with the current trends, technologies and innovations within the industry. There are a number of ways that farmers can keep abreast of the advancements and changes that impinge upon their businesses and practice. Of the 15 that took part in the survey 14 keep up-to-date with developments in the industry by discussion with friends and colleagues, 15 read general farming publications (e.g. Farmers Weekly), 12 read sector specific publications (e.g. NIAB publications, Crop Magazine, Dairy Farmer Magazine), 14 attend shows, seven attend conferences, 12 attend farmers groups, 12 attend training events and six do other things. However, when asked to rank the different modes of knowledge dissemination in terms of usefulness, differences were seen between the high, medium and low performing farmer groups (see table 3)

Table 3. Each of the methods of knowledge dissemination used by farmers has been ranked in order of usefulness. To enable a valid comparison to be made, knowledge dissemination methods have also been ranked in accordance with farm performance (where 1=highest ranking and 7=lowest ranking).

Method of gaining knowledge	ALL	HIGH	MEDIUM	LOW
Read general farming publications (e.g. Farmers Weekly)	1	2	1	1
Attend farmers groups	2	1	6	2
Read sector specific magazines (eg Crop or Dairy Farmer)	3	4	2	4
Discuss with friends or colleagues	4	3	3	5
Training events	5	5=	5	3
Attend conferences	6	5=	7	6
Attend shows	7	7	4	7

It is worth noting that three of the top performing farmers, more than any other group, ranked 'other' as the highest source of knowledge. They specified the internet as being this source.

Eleven out of the 15 farmers interviewed cite the internet as a significant source of information and knowledge. Figure 8 shows a word cloud based on the answers given by farmers to the question 'Explain how you use the internet to improve your knowledge of the sector?' Farmers' full responses regarding internet use give more detail as to the way in which the internet is used:

'Following 'Positive Farmers' and 'Pasture to Profit' and 'Tillers Discussion Group'; also colleagues that use social media that share relevant industry information - specific to farming sector that farm is in.'



Figure 6. A word cloud to show the popularity of words used by survey participants to answer the question 'what is your preferred way(s) of gaining knowledge about the industry now and why?'

Those farmers in the lower performing group attend industry specific training events more than the medium and high performing groups. 12 of the 15 farmers interviewed have attended an event within the last year.

Participants were asked whether there are any barriers to them attending these events. Figure 8 shows a word cloud of the most popular words used in response to this question. As can be seen, time constraints are cited as being the most problematic, along with being too busy, not being near enough or 'local' and the timing of the events i.e. the events are arranged during busy times of the year or they are held during the day and not evening. Other factors include the difficulty of attending events when there is only one main farmer, implying that it is difficult to leave the business for a day when only a few people are employed in the farming business. Also, the relevance of the courses are cited as reasons for or against attending, for example, incentives such as NRoSo points were stated as a positive reason for going, as well as courses associated with specific interests such as agronomy. Some farmers' comments on the barriers that prevent participation in training events are shown below:

'Would go to more if there were more locally, but most of the arable training events are in the East and it takes too long to get there'

'Work commitments; farm always takes priority- mainly one man on farm so time away is not always easy to get. Sometimes worthwhile going to training to meet other colleagues-social side also important. Farming is a solitary existence sometimes. When worked for Defra doing inspections miss

the on farm interaction the most. Farm walks are a very good idea. Can demonstrate what people are doing is right’.

‘A lot of events don't seem relevant to the type of farm it is so don't tend to attend. Most useful ones are Vet and Eblex - lots available in local area’



Figure 7. A word cloud to show the most popular words used in response to the question ‘Are there any barriers which prevent you from taking part in training events and if so what are they?’

Table 4. A table showing the ranked responses to the question ‘when you think about your business can you list the following in order of importance to you (where 1=highest ranking and 7=lowest ranking)?’

Aspects of the business	ALL	HIGH	MEDIUM	LOW
Lifestyle	4	3	4	4
Having a successful business	1	1	2	1=
Long term financial security	3	2	1	3
Maintaining the family farm for future generations	2	4	3	1=
Trying out new ideas	6	6	5	6
Providing employment for other family members	5	5	6	5
Other	7	7	7	7

Participants were asked about certain aspects of their farming businesses that were most important to them (see Table 4 for a list of those aspects). The responses were ranked in order of importance and these results can be seen in Table 4 above. Participants were most

concerned about having a successful business and this stayed pretty constant across the three performance groups. Some differences were seen when asked about maintaining the family farm for future generations, but as many farmers pointed out, if the business is successful and financial security has been achieved, then the farm should remain in the family.

When asked what is the most important factor in farming between education and training, confidence, attitude and other (luck or financial security), the 15 participants responded in the following way; 11 cited attitude as being the most important factor or attribute, five cited confidence, three cited 'other', and education and training was placed last with only two participants stating that it was the most important factor.

Participants were asked the question 'when it comes to making those decisions, what value do you put on knowledge and understanding?' Their responses were collated and entered into a word cloud generator as shown in Figure 9. Some farmers' responses to this question can be seen below:

'Underpins every area of what we do. 1- open to change. 2- willing to take risks/new ideas. 3- receptiveness to people on farming and training. Down to individual-underpins whole business. How well a farm is doing is linked to attitude'.

'To try out new ideas. Need confidence in trying them out. Education is pretty key as well'.

'If you haven't got a good attitude you won't do any of a (education and training) or b (confidence). You can be uneducated but still have the right attitude to go forward'.



Figure 8. A word cloud to show the popularity of words used by participants in response to the question 'when it comes to making those decisions, what value do you put on knowledge and understanding?'

Farmers were asked about the value of knowledge and understanding when making decisions. Some of their responses can be seen below:

‘Knowledge is very important, can't make decisions without research beforehand. Need to make decisions based on a robust bit of research and realise that in farming things can change so quickly therefore don't attach too much confidence to certain factors like lamb price-can be volatile and out of farmers hands’.

‘Knowledge and understanding is the main bit of making a decision. Also need confidence that it is going to work out’.

‘High. Need to know what you're doing and have the confidence to do it.’

There is a high value placed on knowledge and understanding by farmers. There is a clear need for good quality knowledge and understanding in order to make decisions with confidence. This is seen as important for the business. Words such as research indicate what needs to be done in order to gain the knowledge required and this is known by the

participants, but other words such as business, financial, money and figures indicate what farmers think is important to have knowledge about.

Farmers were asked what role education and training has in meeting the future needs of farming. Some of their responses are shown below:

‘So important - anyone coming into farming without scientific/technical/IT background would struggle. So intertwined with farming practices. Looking back only 1/4 of colleagues on degree programme are actually farming, the rest are in ancillary industries surrounding farming’.

‘Very important - sandwich/day release courses are good as away from home. Getting education and experience in a different environment. Has a role to play.’

‘Vital, if the younger generation would only accept it. As it would make them questions it and balance better to what you are doing. If you don't question what your Dad did you'll never do it better’.

The link between risk taking and education was explored during this study. Some of the participants in the study indicate that an educated approach is important in taking decisions that may involve an element of risk; this may be termed risk minimisation:

‘Farm doesn't take risks-likes to make educated decisions. Always make a calculated pre-budgeted analysis of potential decisions’.

One participant indicated that sometimes risks are taken without full understanding, but at the same time highlighted the need have a better understanding:

‘It is quite important to take the risk. You take risks all the time and sometimes we don't necessarily understand the risks we take. Risky business we are in’.

Business knowledge is important in taking risks according to one participant:

‘Very- individual is risk averse; will try new ideas but within boundary of business. Not prepared to take calculated risks. Should take risks alongside trying new ideas within boundaries of business.’

Also, risk taking requires practice as well as education:

‘Very, but I’m not very good at doing it. Have to practice educated risk taking’.

Clearly, there is a link between knowledge and understanding, education and risk taking.

The age of the primary farmer/decision maker was ascertained as there is thought to be a potential link between age and perception and attitudes towards education. Table 5 shows the age of the primary farmer/decision maker (within a range) and the farm business performance. If there is a trend here, it is that as the primary farmer gets older, the performance of the farm business improves.

Table 5. A table showing the number of high, medium and low primary farmers/decision makers within specified age ranges.

Age	HIGH	MEDIUM	LOW
30 – 40	0	0	1
41 – 50	1	2	1
51 – 60	2	1	2
60+	2	2	1

CONCLUSIONS

- Analysis of the quantitative data indicates that agriculture-specific education can enable farmers to perform better in comparison with those without an agriculture-specific education
- On analysing FBS 2014/15 data, there is a difference in Farm Business Income between farmers grouped by educational status
- On analysing FBS 2014/15 data, there is a difference in Net Farm Income between farmers grouped by educational status
- Those farmers with a GCSE-only or equivalent level of qualification perform far less well, according to the Net Farm Income Metric, than other educational groups
- The National Diploma educated group out-performed the School-only educated group in terms of Net Farm Income to a statistically significant level
- Those with GCSE only qualifications performed much better when using the Farm Output metric
- The National Diploma educated group out-performed the School-only educated group in terms of Farm Output to a statistically significant level
- Although agriculture specific education is seen to make a difference in terms of farm performance, there is no obvious link between the level of agriculture specific education (certificate, diploma or degree) and farm performance
- Farmers generally viewed their own education as having been useful to further their understanding of farm accounts, business and technical knowledge, however, in general, farmers' perceptions of their own education is at best mixed
- High performing farmers do not perceive their own education as having been that useful to them, whereas, both medium and low performing farmers have a higher opinion of the usefulness of their own education to farming operations
- Farmers view gaining the next level of education as having no benefit to them or their business
- Farmers use a variety of methods to keep up-to-date with industry advances and innovations. General as well as the more specific farming publications are the most popular sources of information and knowledge, however, shows, farmers groups and training events are also used
- High performing farmers prefer to gain their knowledge through farmers groups, general farming publications, discussion with friends and colleagues and the internet
- High performing farmers cited the internet more often than medium or low performing farmers as the most valuable source of information (three out of five)
- Medium performing farmers value general farming publications as good sources of information as well as discussing issues with friends and colleagues

- Farmers groups are highly valued by both high and low performing farmers, whereas medium performing farmers ranked farmers groups as equal 7 out of 8
- 11 out of 15 farmers cite the internet as a valuable source of information. Farmers are highly specific in their use of the internet to gain knowledge with a particular focus on subjects to do with business, management and husbandry programmes
- Barriers to attending training events include time, being too busy, events being too distant from the farm and the timing (in the year) of events
- All farmers viewed the success of their farming business as a key priority. Moreover, trying new ideas was not seen as a priority
- Farmers viewed attitude as being the most important factor in running a successful farming business, with confidence ranked as the next important factor and education and training as the least important of the listed factors
- There is a high value placed on knowledge and understanding by farmers, with a particular emphasis on using good quality knowledge and understanding to make informed decisions
- There is a link between knowledge, education (in its broadest sense) and risk taking. Knowledge and understanding of the farming business is viewed as important when taking decisions that involve an element of risk.

DEFINITIONS

Farm Business Income (FBI) for sole traders and partnerships represents the financial returns to all unpaid labour (farmer's and spouses, non –principal partners and directors and their spouses and family workers) and on all their capital invested in their business, including land and buildings.

Net Farm Income (NFI) assumes all farms are tenanted and that all tenant type assets are owned by the farmer. It represents the return to the farmer and spouse for their manual and managerial labour and on tenant type capital in livestock, crops, machinery etc., but excluding land and buildings. It is calculated before deduction of interest payments on any farming loans and also excludes interest earned on any financial assets owned. (Breeding Livestock Appreciation [BLSA] is excluded from total farm output and therefore not included in net farm income).

Agricultural output is the main measure of individual crop and livestock output. It comprises: (a) Crop enterprise output, which is the total value of crops produced by the farm (other than losses in the field and in store). It includes crops used for feed and seed by the farm business and those consumed in the farmhouse and by farm labour. Crop enterprise output is calculated on a "harvest year" as distinct from an "accounting year" basis; that is, it refers only to those crops (with the exception of certain horticultural crops) wholly or partly harvested during the accounting year and excludes any crop carried over from the previous year. Thus valuation changes (between the previous and current crops) are not relevant and the total harvested yield of the crop is valued at market prices (plus any subsidies). However, any difference between the opening valuation of any stocks of previous crops and their ultimate disposal value (sales, used on farm and any end-year stocks) is included in total farm output. (b) By-products, forage and cultivations, which cover the value of output of the byproducts of agricultural activity, sales of fodder, valuation changes for fodder and cultivations. It also covers revenue from the letting of bare land or forage on a short term lease. (c) Livestock enterprise output comprises the total sales of livestock and livestock products including direct livestock subsidies and production grants received, part of the valuation change (see below), produce consumed in the farmhouse and by labour and the value of milk and milk products fed on the farm (excluding direct suckling) adjusted for debtors at the beginning and end of the year (except for direct livestock subsidies) and transfers between enterprises; less purchases of livestock and livestock products from outside the farm business. Stock appreciation for breeding livestock (cattle, sheep and pigs) has been excluded from individual livestock enterprise outputs. However, changes in the numbers of breeding livestock between the opening and closing valuation and the total valuation change of trading livestock are included. Unlike crop enterprise output, livestock enterprise output is calculated on an accounting year basis. (d) Miscellaneous output covers the value of output from those

activities which are still within the agricultural cost centre but do not fall within either livestock or crop enterprise output. These will include revenue from wayleaves, agricultural hirework, sundry woodland sales, contract farming rent, miscellaneous insurance receipts and compensation payments.

Farm Output (Total Farm Output) is total crop enterprise output plus adjustment for output from previous year's crops plus total livestock enterprise output plus output from home grown fodder crops plus output from tillages and forage plus output from non-agricultural diversified activities plus miscellaneous revenue plus single payment.

APPENDIX

1. Questionnaire

FARM NUMBER:

Farm Performance and Education and Training

Age of primary farmer?

Who is being interviewed?

What role do you play in the business?

What role do you have in the decision making process?

Has anyone else involved in the business have a higher or equivalent educational qualification to you? Yes/No

If yes, what?

Section A.

1. Which did you attend?

- a. School only
 - i. O Levels/GCSE's
 - ii. A Levels
- b. Land Based/Agricultural College
 - i. National Cert/Level 2.....
 - ii. National Diploma/Level 3.....
- c. Other type of college
 - i. National Cert/Level 2.....
 - ii. National Diploma/Level 3.....
- d. Attended one of the above, but didn't complete qualification
- e. Other.....

2. University Degree

- a. Agricultural
 - i. Name of Degree.....
- b. Other type of Degree
 - ii. Name of Degree.....

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3. How much do you think your college/university course helped in your working life in farming?

- a. Not at all
- b. A little
- c. Quite a bit
- d. A lot
- e. Has been essential

4.

a. If you did go to college or university can you explain in more detail how the experience helped your farming career?

b. Do you feel that attending the next level qualification would have been beneficial to your farming career?

5. How do you keep up to date with developments in the industry?

- a. Discuss with friends/colleagues
- b. Read general farming publications e.g. Farmers Weekly, Farmers Guardian
- c. Read sector specific material e.g. Crop Magazine, Dairy Farmer Magazine
- d. Attend shows
- e. Attend conferences
- f. Attend Farmers Group meetings
- g. Training events
- h. Other

6. Can you place the above in order of usefulness (1-8)?

7. Do you use the internet to improve your knowledge of the sector? Yes/No

a. If yes, please explain how?

8. What is your preferred way(s) of gaining knowledge about the industry now and why?

9. How often do you attend organised training events?

- a. Very Rarely
- b. Once a year
- c. Twice a year
- d. Quarterly
- e. Monthly

10. When was the last time you attended an organised training event?

- a. Within the last 3 months
- b. Within the last 6 months
- c. Within the last year
- d. Within the last two years
- e. Within the last five years
- f. Can't remember

11. Are there any barriers which prevent you from taking part in training events and if so what are they?

12. When you think about your business can you list the following in order of importance to you (1-7)?

- a. Lifestyle
- b. Being successful in business
- c. Long term financial security
- d. Maintaining the family farm for future generations
- e. Trying out new ideas

- f. Providing employment for other family members
- g. Other.....

Please add any comments here to clarify your answers to question 12 above.

Section B

13. In your opinion which is the most important factor in farm business success;

- a. Education and training
- b. Confidence
- c. Attitude
- d. Other

Why?

14. How important do think risk taking is to a successful business?

15. When making a business decision what part does knowledge and understanding play in making judgments about the risks involved?

16. What role do you think education and training has in meeting the future needs of farming?

17. Do you have any other comment to make?

2. Farmer responses to questions

Question 4a: If you did go to college or university can you explain in more detail how the experience helped your farming career?

'Wasn't actually what learned- having the confidence to make own decisions. Educated decision on what knew and learnt, not just to be told stuff from reps; make informed decisions.'

'Got into farming; enjoyed working on farms. Went to college to learn about it + have the knowledge. Learn't a lot of stuff that isn't relevant today. Some of the basics are still relevant today. Believes that a lot of agriculture can be learned on the job . Not enough explained at college.'

'It didn't help me. It was a year's holiday, a year away from home. It also seperated me from my Dad for a year.'

'Left school at 16 and went straight into farming.'

'It is part of your development, your personality. It gives you a different way of doing things. As my father was here before and had his way of doing things. E.g. my son went away and come back and since then has converted the barn into a house and offices to rent out and put up a turbine.'

'Fuelled an interest in furthering knowledge - research everything online. Started by being self-motivated to learn and find out things. Self -motivated is very important and scientific background helps background helps to understand what is happening on farm.'

'Some bits were more useful than others. Gives you a foundation to learn on. Learnt as much on the year out as I did at college, as worked on a good farm doing a broad type of work'

'Completed a two year college diploma in Agriculture and Business and Marketing at Harper Adams College. The Diploma in Agriculture, the husbandry side of it was useful. For the marketing not got into it as much but used it for the marketing of crops.'

'Sandwich course; 2 farms - I did lots of good; learnt job. Taught how to work. When work for other people need to get up & do things. Translated a lot of ideas from these farms when you come home. Instilled a work ethic - taught a lot of what consider essential management.'

'Taught processes of farming- livestock and arable. Management and arable side. Carried on to today.'

'It gave me a better understanding of accounts, cashflow and budgeting. I still only budget in my head but still think about it. Generally makes you questions things a bit more.'

'Engineering Qualification has helped a lot on the farm over the years. A lot of basic agricultural maintenance is done by the farmer which saved a lot of money over the years.'

'Going to college has mainly helped me by teaching me how to do the accounts, as it meant I could take over the accounts from the secretary and do myself. Also helped with the Business management side of the farm.'

'You understand why you are doing what you are doing. It gives you a wider understanding'

Question 4b: Do you feel that attending the next level qualification would have been beneficial to your farming career?

'Owner-thinks it would have been good, likes to surround himself with experts-but makes decision. Important farmers sons go & work away and not just work at home. Manager-education; not necessarily so but feels important that go and travel and experience different farming types.'

'No'

'Not really. Sometimes when you don't know anything you get an expert in and you are often better getting an expert in than thinking you know it. As an expert knows what they are doing.'

'Don't think so. Think it's more beneficial seeing what other farms are doing and how they are doing it, to see how we could improve our farm.'

'Always have a questioning mind-always unpick data rather than take it as face value. B. Possibly not. Hindered by becoming too specialist. Nearly did a Masters-but in hindsight was a good thing.'

'No, for what I did no. Only more helpful if gone down a different path then I would have needed it e.g. managerial role. For what I did hands on learning was enough.'

'Don't think so.'

'No- Hill beef & sheep farm at home; need more practical farm experience. Farm work at college was more beneficial than (classroom) learning. Learn't how to also look at business management of farms.'

'No don't think so, there would have been no long term benefit.'

'No, wouldn't have made any difference to how farming career would have gone if farmer had studied a higher qualification in engineering.'

'Yes it would have helped, but my father wouldn't let me go as he needed me on the farm.'

'In hindsight yes - in today's society you need qualifications to do everything eg. Spraying- actually courses seem to cater for farming needs eg. rat poison etc. Qualified operator.'

'No, don't think so as would have been a masters.'

Question 7: Do you use the internet to improve your knowledge of the sector? Explain how.

'Legislative websites-consult online reading up on specific topics e.g mineral supplements for sheep - Animal Health'

'Following 'Positive Farmers' and 'Pasture to Profit' and 'Tillers Discussion Group'; also colleagues that use social media that share relevant industry information - specific to farming sector that farm is in.'

'Look up cattle details, like bull names. To find new machinery. Look at sales catalogues and reports from livestock sales. Generally to look things up.'

'Use it for looking things up. Look at World forums as they are international and have different ideas of solving problems and can keep up to date with things. You can also do everything on the internet-buy things and check things, and it is 24hours, 7 days a week'

'My son tends to use the internet to look things up. I don't tend to use the internet as we don't have very good signal.'

'Every day, member of many discussion forums. Levy Groups-AHDB website useful. HGCA info very heavily used. Scientific papers-linked to own farming- read a lot of.'

'Use it to look up more indepth things up. Not primary source e.g. Farmers Guardian but is the next port of call before phoning someone up to ask more questions.'

'Looking up things e.g. different crops. Used it to try and decide the viability of growing a new crop on the farm.'

'Have good broadband at farm; but don't really use it apart from auction reports.'

'Use Farmplan programmes and cattle/sheep management programmes - for business management.'

'Only use the internet a lit bit, generally it is just googling things.'

'I use the internet to google if I need to know anything specific. Receive weekly emails from AHDB on prices and general email updates from various sources on what is happening within the industry.'

'Use CTS etc. TB/machine parts etc.'

'Use the AHDB website. Look at different websites to look at the latest results. Do a bit of online training as trained agronomist.'

Question 8: What is your preferred way(s) of gaining knowledge about the industry now and why?

'Legislative literature - if need to know more go and investigate.'

'Conferences- spend a lot of money on attending; but attending with industry leaders + professionals is hugely beneficial to farm. Also have an excellent farm consultant-important to have an independent person to advise on farm decisions. Feel constructive feedback is important to industry'

'Someone to tell me. It's the easiest and most time effective way. You can ask questions back and have a general discussion about it.'

'Internet; due to the amount of information on it and the ease of accessing it. Through it I can find out what farmers in Canada are doing and how rice is grown.'

'Reading in the press. It is just there, comes on a Friday and you can read it over the weekend.'

'Internet- accessible/when suits/can fit round daily work. Like newsletters etc. useful when needed. Can pick and choose online what is relevant to your business rather than an event where say 10% may be relevant.'

'In depth-speaking to the right person. Face to face with someone who knows what they're talking about. Get twice as much done as they're used it or are selling it. Hard to find that person though.'

'Publications and my agronomist. Find they are the easiest. As if you go to shows or conferences it's things I've already seen before. While these can be more targetted to what you want.'

'Reading farming papers; some Animal Health promotion evenings are good- attend occasionally. Mainly Farming press and knowledge from vets.'

'CLA + NFU magazines (monthly) good sources of info and use websites for specific info requests. From spray reps. Frontier weekly update. Arable contractor - given advice. Gleadall free weekly email. Livestock contactor -advice. Bishopton vets and Greens for health, monthly info sheet.'

'Mainly reading the Farmers Guardian and Weekly, mainly because of time.'

'From reading the Farming Press or attending organised talks at Skipton Auction Mart.'

'By reading the Farmers Guardian, as anything new you generally read in the farming press. For anything specific I google it.'

'Prefer to attend training event; would rather read literature, and discuss with colleagues/family members'

'Meetings, face-to-face. As you learn more as you are more atune to it. More likely to take it in that way than if it's on a screen'

Question 11. Are there any barriers which prevent you from taking part in training events and if so what are they?

'Usually distance travelling - Usually to AHDB but if more than 1hr away - if local then will attend'

'Lots of training events aren't specifically relevant to farming practice. Time is an issue; calve in Feb/March + so busy time on farm. Winter is traditionally the quiet time so training events are often hosted in quieter months.'

'Would go to more if there were more locally, but most of the arable training events are in the East and it takes too long to get there'

'Not really. Think that I've done my bit and it's up to the younger generation to do their bit now'

'Work commitments; farm always takes priotity- mainly 1 man on farm so time away is not always east to get. Sometimes worthwhile going to training to meet other colleagues-social side also important. Farming is a solitary existence sometimes. When worked for Defra doing inspections miss the on farm interaction the most. Farm walks are a very good idea. Can demonstrate what people are doing is right'.

'A lot of events don't seem relevant to the type of farm it is so don't tend to attend. Most useful ones are Vet + Eblex - lots available in local area'

'Other interests alongside farm; other business interests. This year especially busy, but normally would be keen to be involved in'.

'Only time. Four businesses are run out of the yard so I'm fairly busy. Only tend to attend events organised by our vets, if they put on an event and it's of interest'

'No barriers, just no interest at this stage in career'

'Time. Lack of time to attend training events as seem to be busy all the time on the farm now. Especially with things like less staff, as son away in New Zealand and employed man having left meaning there is more for me to do'.

Took part in a training session last week. There are no real barriers. I have to go on a lot of courses for agronomy so try and find free ones due to the costs. Also tend to go on courses between November and March as it's the quieter time on the farm'.

Question 13. In your opinion which is the most important factor in farm business success?

'Attitude + luck; alongside individual having ^ BPS/scheme entitlement data, came from FBS figures, decided it was sensible/ realistic decision to make decision to tap into schemes etc.- so therefore need attitude to be able to see opportunities. Restrictions of schemes etc. far outweighed by income from schemes'.

'Because you've got to be able to do it. Got to have the right attitude to do it.'

'Lot of it is to do with luck. Someone once said it is the day you were born. It's just the way things happen to fall. You only get one chance to do things. We had a window where we managed to grow potatoes well during a shortage so made a lot of money and those few years has allowed us to do what we could do since'

'Underpins every area of what we do. 1- open to change. 2- willing to take risks/new ideas. 3- receptiveness to people on farming and training. Down to individual-underpins whole business. How well a farm is doing is linked to attitude'.

'To try out new ideas. Need confidence in trying them out. Education is pretty key as well'.

'Need good attitude; need ability to be motivated and keen to do a job to the best of their ability. Still at 60 the farm is putting a new building up. Attitude to succeed is more, important than anything else'.

'Bit of both, confidence and attitude. If you've got the confidence and attitude then you'll succeed. My nephew has in the last few years invested and bought a lot of new machinery

to set up a contracting business. Has done well but don't think at 21 I'd have the confidence to invest that much'.

'You need to have your heart in farming as it is so difficult, and if you aren't born into farming you need to have attitude and confidence to succeed as it is so hard'.

'Education definitely - need a qualification to do everything; need to be skilled in all areas, need to understand repercussions of decisions e.g. RPA/xcompliance etc'.

'If you haven't got a good attitude you won't do any of a (education and training) or b (confidence). You can be uneducated but still have the right attitude to go forward'.

Question 14. How important do think risk taking is to a successful business?

'Not really-overall farmer is risk averse; sometimes need to speculate but not keen on taking big risks'.

'Farm doesn't take risks-likes to make educated decisions. Always make a calculated pre-budgeted analysis of potential decisions'.

'Got to take risks. Take them all the time in farming, all is a risk'.

'It is quite important to take the risk. You take risks all the time and sometimes we don't necessarily understand the risks we take. Risky business we are in'.

'Got to take a bit of a risk but can't put everything on the line'.

'Very- individual is risk averse; will try new ideas but within boundary of business. Not prepared to take calculated risks. Should take risks alongside trying new ideas within boundaries of business'.

'Yes it is important. To take risks and assess risks'.

'Less motivated than used to be + as a result have decreased output - In current position doesn't need to take risks. Not very important at moment. In past have taken medium risks (but should be sensible) have been taken in-in the past. At moment take less risks.'

'Very, but I'm not very good at doing it. Have to practice educated risk taking'.

'Farmer thinks all farmers take a risk which can range from which sale he sells his lambs at - to deciding not to enter on HLS Scheme which was costly to the business'.

'I don't like being open to risks and try to minimise the risks where possible. I'm happy plodding along where we are at the moment. I think taking risks could be detrimental to the business'.

'Son would take risk; wife wouldn't take a risk. Son thinks business is over cautious. Overall farm takes a cautious approach to risk. Make decisions on a day to day basis e.g. building.

Think other farms get to where they are going quicker by taking risks but not here. As a result have no borrowing/overdraft.

Question 15. When it comes to making those decisions, what value do you put on knowledge and understanding?

'Knowledge is very important, can't make decisions without research beforehand. Need to make decisions based on a robust bit of research and realise that in farming things can change so quickly therefore don't attach too much confidence to certain factors like lamb price-can be volatile+ out of farmers hands.'

'I just get on with decisions. Carry out self assessment in my head to see if it works. Difficult to understand what we do, we just do it'.

'Intuition more. Go more with what you think as you can't predict the future'.

'Knowledge and understanding is the main bit of making a decision. Also need confidence that it is going to work out'.

'Imperative-need to know full extent of direction you want to go. Needs to stack up financially. Need to back up decisions with figures. Farm turned down an opportunity to take on a dairy farm 6yrs ago following research into figures. In hindsight a good decision'.

'High. Need to know what you're doing and have the confidence to do it.'

'Huge value on knowledge + understanding; rely on experience when taking risks + had a good knowledge of ability to get a good return when farm has taken a risk in past'.

'Didn't fully understand financial implications, wasn't as straight forward as farming. Building business is more- financial decisions. Know what getting price etc. - farming is more volatile in terms of weather/price/outside forces(foreign exchanges)- worldwide'.

'A lot. You need to understand what is feasible within the business. My son has big ideas coming back from college and after travelling but financially the business might not be able to afford it as they require a lot of money'.

'Quite high. If you don't know what you are doing then don't do it'.

Question 16. What role do you think education and training has in meeting the future needs of farming?

'Very important - farming becoming more technical + skilled. Computers are key - need knowledge of these - part of everyday life + down to basic knowledge of livestock/arable measures - need to have a sound understanding of bigger pictures. A lot of jobs need direction + understanding rather just being told to go do something. Learning on job is important but need to know why you are doing something'.

'If done properly- then it is massive. Feel colleges should push harder to bring new people into industry. Precision is taking off. Learning on job is important. Farming as a whole needs to do more to retain individuals. If individuals are good they will succeed at farming.'

'Depends on what you mean. Going to an agricultural college or university-none. As being bought up on a farm you learn that way. Hands on, on a farm is the best way. You have to spend your own money, take your own risks and learn that way. If you're losing money you're gaining knowledge. Need to be practical in agriculture'.

'I hope they are still training the experts. Worried that there aren't the experts out there and farmers need experts. Don't think the Research and Development is being done that we need and don't like how it is being funded. Only get funding if of interest or by companies/people with vested interests'.

'So important - anyone coming into farming without scientific/technical/IT background would struggle. So intertwined with farming practices. Looking back only 1/4 of colleagues on degree programme are actually farming, the rest are in ancillary industries surrounding farming'.

'Important as so much to learn now'.

'Very important - sandwich/day release courses are good as away from home. Getting education + experience in a different environment. Has a role to play.'

'Introducing young people to farming - both from farming backgrounds and also new entrants. Farm thinks apprenticeships are good as it introduces people to the industry-suggests big businesses could subsidise them - benefit for both individual +farm specific education not necessarily important'.

'Vital, if the younger generation would only accept it. As it would make them questions it and balance better to what you are doing. If you don't question what your Dad did you'll never do it better'.

'Very important especially with more paperwork to fill out. Things are changing faster than before with more sophisticated technology and machinery like auto steer. Need to be able to keep up with all these changes'.

'It has a high degree, but there needs to be money in the industry for people to earn a living off. If that isn't there then it doesn't matter how educated you are, as people won't want to work in the industry'.

Question 17. Do you have any other comments to make?

'Up to university level you are just told things and you take them as fact - the more experience you have to understand facts you can form own better. Judgement on things+

decisions. Attitude is more important than education-if want to learn to improve then more important than knowledge+ understanding work which requires background knowledge'.

'Important to do monthly budgets-know exactly where the farm is at, at any one time. To know 1/2 way through year if making a profit is important. Knowledge enables you to make better decisions in the future. If write goals down you will achieve them quicker as it focuses the mind. Farmers of the future should be learning alongside practical experience'.

'Need to be practical in agriculture'.

'You have to go with your farms assets'.

'Farmer did degree in ag.-not because he wanted to farm; really wanted to demonstrate quality of education. He diversified by going & getting a job outside farm with Defra & came home later in life. Doesn't think needs a degree-but there is also a lot of good qualifications beside agriculture-that can also provide life skills. Degree gave skills to get job to widen knowledge +that has helped farm. Outward facing'.

'Attitude + constantly examining what you are doing is important + is it creating extra value. Always doing gross margins in life + need to constantly analyse what you are putting into business + are you getting value for money. Education + experience in life are important. Always tried to do best. thing to have best output + performance of farm'.

'Son is currently doing an agricultural apprenticeship but it's very different to what I did and not sure how much use it is'.

'Deliver courses; identify people early on in a course. Ask participants to write a short note as to why they want to attend course-seems to work to have people who want to be there-e.g. Did a live to dead event + over half were not from farming backgrounds. All courses organised through AHDB; 2 a week; organised by the farmer'.

