



An Evaluation of: Accelerating The Adoption Of Productivity Systems For Farming Businesses

A Business Basics Proof of Concept Project
Funded by Innovate UK and BEIS

Yagro Ltd

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1. Executive Summary

The ‘Accelerating the Adoption of Productivity Systems for Farming Businesses’ (Tech Check) Proof of Concept (PoC) was one of 12 projects awarded funding through Round 2 of the Business Basics Fund in September 2019. The concept was developed by Yagro Ltd to develop a Technology Audit for farms to help them discover, understand, and adopt possible technology solutions to improve their productivity with the help of Technology Experts.

The project set out to investigate two main hypotheses to determine if an economically viable service could be offered which increases farm technology in the industry:

- A service can be developed which has valuable impact on farms by increasing their adoption of technology and therefore business productivity.
- This service can be economically viable by returning appropriate value to the farm and to the service provider.

To test the hypotheses the PoC initially focused on developing a Technology Audit and Personal Technology Audit Report for the participants . Three intervention approaches with different levels of innovation and digital enablement were then designed to determine which approach is most effective in delivering the Audit and increasing technology use:

- **Traditional Approach:** Technology Audit completed in person or over the phone with one-to-one support from Yagro and the Technology Experts.
- **Digital Enabled Approach:** Technology Audit completed online followed by a half-day workshop with local farmers and the Technology Experts.
- **Full Digital Approach:** Technology Audit completed online with individual access to online educational videos from the Technology Experts.

The Technology Audit was developed to assess the farm’s knowledge and use of specific technologies across the following 7 areas:

Procurement
Benchmarking
Grain Marketing
Precision Farming
Crop Management
Finance Software
Compliance Tools

To determine which approach was the most effective in increasing the adoption of new farm technology, a robust evaluation methodology was designed to collect quantitative data on the project outputs, outcomes and impacts from participants. During the PoC, 149 farms were contacted with 73 farms signing up across the three approaches. Table 1 below summarises the completion rate for each of the

Approaches, which is classified as completing the Technology Audit and the Post Intervention Survey.

Table 1 – Approach Completion Rate

Approach	Recruitment Aim	Number of Farms Signed Up	Completion Rate
Traditional	12	12	83%
Digital Enabled	16	13	77%
Full Digital	97	48	46%

The wet Autumn weather in 2019 and dry Spring weather in 2020 affected the Approaches due to the farms being busy during what is usually classed as the ‘quiet period’ of December – February. This impacted the recruitment and attendance of the Digital Enabled Approach and completion rate of the Audit for the Full Digital Approach as well as impacting the time available for Traditional Approach participants.

A Pre Intervention survey was completed before starting the Technology Audit and after completing the interventions related to each of the Approaches a Post Intervention survey was completed in order to quantify the change in our ‘Outcome Measures’. To measure the ‘Intermediate Impacts’ farms were asked to complete a Final survey to measure the effectiveness of each of the approaches in increasing technology adoption.

The quantitative surveys showed that on every identified Outcome Measure, all three of the Approaches resulted in a positive change. As a result of participating in the interventions, participants were on average more knowledgeable about the farm technologies covered; understood the advantages and disadvantages of the technologies better and increased their ability to decide whether to adopt new farm technology.

Although all three of the Approaches were successful in influencing the Outcome Measures, the Digital Enabled Approach had the greatest impact on participants’ level of adoption of new farm technology, with a 37% increase in the participants average adoption level score. 90% of the participants in the Digital Enabled Approach reported that it changed their view of adopting new farm technology either ‘Somewhat’ or ‘A lot’, with 70% of the farms intending to implement some, most or all of their Technology Audit Report recommendations.

However, the study found that the Digital Enabled Approach is not economically viable in its current format, with a delivery cost over 5x the stated willingness to pay. Nevertheless, we believe that changes in the design of the workshops, namely running concurrent Expert sessions throughout the day would enable the Approach to be economically viable and be able to maintain its value proposition.

Given the success of the Digital Enabled Approach in proving the project’s first hypothesis the recommendation of this report is that Yagro should progress from a Proof of Concept to a full scale trial. A full scale trial would seek to test the second hypothesis further to see if the Digital Enabled Approach can be offered as an

economically viable service by adapting the workshop format to allow more farms to attend each workshop, thus reducing the cost of the service.

2. Introduction

England is on the cusp of the Fourth Agricultural Revolution, where digital technology promises a productivity boost unseen since the Green Revolution of the post-war era. There are a wide range of potentially productivity-improving tools and techniques in the industry which, despite well documented impact, have failed to reach mass adoption. Key to solving this problem of adoption, is research in methods of dissemination, and how innovative approaches might help acceleration through better awareness, understanding, and access on farm.

As part of the government's Industrial Strategy in 2018 it established the Business Basics Programme. The programme run by the Department for Business, Energy and Industrial Strategy (BEIS) in partnership with Innovate UK and the Innovation Growth Lab at Nesta (NESTA) is designed to test innovative ways of encouraging small and medium sized enterprises to adopt existing technologies and management practices to improve their productivity.

The 'Accelerating the Adoption of Productivity Systems for Farming Businesses' (Tech Check) Proof of Concept was one of 12 projects awarded funding through Round 2 of the Business Basics Fund in September 2019. The concept was developed by Yagro Ltd to see if there is an economically viable model that can increase farm productivity through a technology adoption service.

At Yagro we are a team of farmers, entrepreneurs and technologists, with a mission to connect agriculture to drive a more financially sustainable farming sector. We are ideally placed to test this concept as a leading data and technology provider in the Agriculture industry. Our initial experience, from working with over 1000 farming businesses in the UK, shows that, while farmers typically have surface awareness of many technology tools, they often have low understanding of them (linked to lack of access), and limited skills, capability, and time to implement thoroughly.

Farming SMEs are an extreme case in the barriers they face for adoption of new technology:

- Demographics: the median age of the English farmer is 58. There is relatively little penetration of 'digital natives' in the industry, which struggles to attract younger talent into the workforce. In part, this is due to the perceived lack of technology in the first place, creating a vicious cycle of restriction to talent.
- Geography: farming businesses are scattered far and wide across England, and do not benefit from the idea and best practice exchange which takes place across SMEs in urban contexts. Furthermore, low rates of labour exchange across these geographically disparate businesses reduces the cross-fertilisation of knowledge and experience.
- Connectivity: until recently, access to data-rich systems in rural areas has been limited because of poor mobile and broadband connectivity. The roll-out of 4G technology and the government's agenda on rural broadband presents new opportunity in this space, with 5G promising further potential still.

- Low collaboration: farming is a competitive business, and there is relatively little exchange of best practice and ideas across competing businesses.
- Need for personalisation: each farming business is unique, and needs specific consideration. Therefore a 'mass marketing' approach does not lend itself to understanding and adoption by the target farms. However, tailoring the sales pitch comes at a cost to the provider which is often uneconomic.

These factors combine to make the cost of technology dissemination very high: farmers are hard to reach, they are busy, they have limited understanding of the technologies offered, and limited points of information on which to assess the likely benefit of that technology. As a whole the industry also has a history of undervaluing advice from both companies and industry bodies which leads to a low willingness to pay for such services, creating a complex and challenging environment.

To test the PoC we developed a Technology Audit for farms to help them discover, understand, and adopt possible technology solutions to improve their productivity with the help of Technology Experts. The Audit process was branded as Yagro Tech Check and focused on testing three approaches to delivering the Technology Audit with different levels of innovation and digital enablement, to assess the impact on efficiency and efficacy of dissemination of the technology tools:

- Traditional Approach
- Digital Enabled Approach
- Full Digital Approach

The different Approaches were designed to find the balance between the cost of delivery of the Technology Audit and personal report and the efficacy of the Approach in increasing a farm's technology use and ultimately their productivity.

The PoC aims to test the following hypotheses:

- A service can be developed which has valuable impact on farms by increasing their adoption of technology and therefore business productivity.
- This service can be economically viable by returning appropriate value to the farm and to the service provider.

This report aims to add to the evidence base of what works in encouraging SMEs to take up productivity boosting ways of working. We have undertaken a robust approach to evaluation, using the overarching Evaluation Framework developed by BEIS, as the basis for our methodology.

3. Evaluations Aims & Methodology

3.1 Evaluation Aims

To ensure that there is a strong evidence base to support the findings from the PoC, an evaluation plan was developed during the project design phase, using the BEIS Evaluation Framework with support from BEIS and NESTA. As part of the evaluation planning, a 'Logic Model' was developed to describe the intended mechanism for change that the project seeks to influence, and to identify what data needs to be collected during the different stages of the project, to be able to determine whether the intended change has been achieved.

To measure the 'theory of change' we used the 'Stages of Adoption Model' that BEIS developed for the Business Basics Programme. This is illustrated below in Table 2. This model describes the various stages that a farm goes through on its journey toward adopting innovative technologies and business practices.

Table 2 - BEIS Stages of Adoption

Stage	Description
Knowledge and awareness	The farm has been exposed to a new innovation or business practice, but has not been inspired to find out more information.
Persuasion	The farm is interested in the new innovation and actively seeks related information.
Decision	The farm weighs up the advantages/ disadvantages of using the new innovation and decides whether to adapt or reject the innovation.
Implementation	The farm has adopted the innovation. During this stage they determine the usefulness of the innovation and may search for further information about it.
Confirmation	The farm finalises its decision to continue using the innovation. They may also seek to optimise or expand their use of the innovation.
Openness	The farm's 'absorptive capacity' for new technology is increased and they now actively seek information on other innovations.

Our logic model, illustrated in Figure 1 below, is based on the 'theory of change' that by providing the Tech Check service through the three different approaches we can overcome some of the adoption barriers and enable farms to move upwards through the stages of adoption.



Figure 1 - Tech Check Logic Model

The immediate outcome of the project activity is therefore expected to increase the farm's level of knowledge and awareness, perceived usefulness and ability to make an informed decision regarding farm technology in the following areas:

- Procurement
- Benchmarking
- Grain Marketing
- Precision Farming
- Crop Management
- Finance Software
- Compliance Tools

The Intermediate Impact of this PoC aims to increase participants' likelihood of adopting new technologies and implementation of their Technology Audit recommendations.

The Ultimate Impact of the project is that the participating farms will increase their productivity through the increased and correct use of farm technologies. Due to the short-term nature of the project (1 year from project start to end), it is not realistic to expect to see changes in the Ultimate Impacts due to the nature of Farming. Therefore, the evaluation is designed to capture data on the Immediate Outcomes and Intermediate Impacts from the project.

Following guidance from BEIS and NESTA the PoC has been designed to meet Level 2 of the Maryland Scientific Scale using a Parallel design. Although a Level 3 is usually required by the BEIS Evaluation Framework, NESTA approved the evaluation design for the PoC on the basis that PoCs are usually about exploring the feasibility and potential impacts of solutions.

This means that the evaluation:

- Collects before and after data.
- Compares each of the treatments (approaches) against each other.

3.2 Method for Farm Recruitment

The PoC had a target of recruiting 125 farms across the three Approaches. Each of the Approaches was allocated a similar amount of funding and therefore due to the difference in nature of the Approaches the proposed recruitment and completion rate numbers were as follows:

Table 3 – Farm Recruitment Numbers for Each Approach with Completion Rate (Completion Rate is classified as completing the Technology Audit and the Post Intervention Survey)

Approach	Budget	Recruitment Aim	Actual Number of Farms Recruited	Completion Rate
Traditional	£10,642	12	12	83%
Digital Enabled	£11,616	16	13	77%
Full Digital	£12,243	97	48	46%

As part of the evaluation plan, eligibility criteria for participation was set out as:

- An English based SME (using the EU definition of <250 employees and <£50m turnover).
- Arable holdings between 120 – 1999 Ha.
- The SME had not exceeded the maximum De Minimus funding limit.

Various recruitment strategies were employed across a variety of channels from; direct email and telephone communication to a target list of around 150 farms that met the project criteria and wider promotional activity through social media, advertising, editorial articles and networking. The networks listed below were used to engage with potential farms with the following percentage of farms recruited from each of the networks:

Table 4 - Percentage of Farms Recruited Through Each of the Networks

Network	Traditional	Digital Enabled	Full Digital
Yagro Farm Network	75%	92%	94%
Increment Ltd	17%		
Farmers Weekly	8%		
LEADing Rural Business Programmes		8%	
Farmers Guardian			2%
Arable Farming			4%
Institute of Agricultural Secretaries			
Technology Expert Networks			
Agri-TechE Network			
Twitter			

As shown in Table 4, in the end the majority of the participants were recruited through the wider Yagro Farm Network, we found it to be the most successful method as the farms could be directly contacted through email and phone calls. However, this was a very time intensive way of recruiting farms and we therefore incurred higher management/labour costs than we had originally anticipated during the Approaches. We were particularly disappointed in the return we had from the paid advertising through Farmers Guardian and Farmers Weekly with only a total of 2 farms recruited through this method.

Due to an increase in the amount of time required to complete the initial PoC Design Work Package and time restraints for when we could offer the different Approaches during the winter, we had to adapt how the farms were allocated to the 3 Approaches. Instead of recruiting all of the farms prior to starting the Approaches and then randomly allocating them to the different Approaches, which would have been the ideal method, the farms were recruited to one of the specific Approaches. We recruited for the Digital Enabled Approach first as the workshops were organised for the end of January, all of the farms that were contacted and unable to attend were then offered the other two Approaches. We then recruited for the Traditional and Full Digital Approaches with the farms having the ability to select which Approach they wanted. As we were only looking to recruit 12 farms for the Traditional Approach, once this recruitment target was met, only the Full Digital Approach was offered. If the farms were not interested in participating in the Approaches that were offered at the time, we captured whether they would have chosen a different Approach. Analysis of the farms that declined to be involved is shown in Section 6.7. This method of recruitment may have impacted the farms' experience and the value they received from the Approach, as such, we looked to capture if they believed they would have gained more value from a different Approach in the feedback from the Final Survey. Analysis of the question related to this can be found in Figures 21 and 22 in Section 6.4.

3.3 Data Collection Method, Technology Audit and Survey Design

The core part of the Tech Check service was the Technology Audit and personal report each of the farms received regardless of the approach, a copy of the Audit and example Technology Audit Report are included in the Appendices. The Audit was designed by Yagro and Increment Ltd with the help of 5 Technology Experts:

Bryony Parker, BP Consulting – Finance Software
Daniel Jolly, Yagro – Procurement
Daniel Kindred, ADAS – Precision Farming
Giles Blatchford, JP Trett – Benchmarking
James Bolesworth, CRM – Grain Marketing

Technology Experts were not used for the Crop Management and Compliance areas as we found it difficult to find an independent advisor for Crop Management Software and the Compliance tools did not have enough complexity to warrant expert advice.

The Audit process began with gaining consent for the farm to participate in the research project followed by the Pre Intervention survey, which was designed to collect data on the Outcome Measures described in the project Logic Model in Figure

1. A copy of the survey is included in the Appendices. The survey asked a series of questions and, using a Likert-type scale, asked respondents to rate their current level of:

- Knowledge/awareness of the listed farm technology areas.
- Perception of the usefulness of the farm technologies to help achieve their business objectives.
- Ability to decide whether to adopt new farm technologies within each area or not.

The Audit was then completed either verbally or online depending on the Approach. The farm's general information was collected followed by detailed information regarding the farm's use of technology across the following areas:

1. Precision Farming Tools
 1. GPS Guidance
 2. Mapping
 3. Variable Rate Application
 4. Weather Data
2. Procurement
3. Grain Marketing
4. Benchmarking
5. Crop Management/Recording Software
6. Finance Software
7. Compliance Tools

The Audit was then analysed by Yagro and the farm was given a Technology Adoption Score for each of the areas along with personal recommendations within their Technology Audit Report. An overview of farm technology in the UK was also created for each of the areas on the [Yagro website](#), and where relevant, direct links to the pages were included in the individual reports.

The farms were then offered varying levels of educational support from the Technology Experts depending on the approach, to help them bridge the understanding and skills/capability gap, and feel confident in reaching out and implementing new technology tools.

Once they had completed the intervention the farms were then asked to complete a Post Intervention survey (a copy of the survey is included in the Appendices) to measure changes in the Immediate Outcome Measures as well as their initial commitment towards the Intermediate Impact Measures, including:

- The likelihood that they will adopt one or more of the Audit recommendations.
- Identifying what further support they would need to implement the recommendations.

As this PoC was proposed by Yagro in order to research the viability of offering it as a service additional questions were included in the Post Intervention survey to assess:

- Whether the farm would recommend the service.
- How much they would be willing to pay for it.
- What aspect of the service contributed the most to changing their view of adopting new technologies.

The Approaches were completed between December 2019 and May 2020. Each of the farms was then contacted in June 2020 during the ‘summer lull’ in the Farming year to once again assess changes since completing the intervention in regards to the Immediate Outcomes, Intermediate Impacts and further detailed information on the viability of the service. Due to the circumstances of the Covid-19 pandemic a question was also included in regards to the impact it has had on the farm’s ability to adopt new technology. A copy of the Final survey is included in the Appendices. The project achieved a good response rate for the survey which was emailed directly to each of the farms with the vast majority of participants only needing one additional phone call reminder. The following percentage of farms completed the survey for each of the Approaches:

Table 5 – Final Survey Response Rate

Approach	Completion Rate
Traditional	90%
Digital Enabled	90%
Full Digital	86%

3.4 Data Analysis

The before and after data from the farms that participated in each of the Approaches was analysed and compared between them to determine which model was most effective in impacting the Immediate Outcomes and Intermediate Impact Measures. The additional service questions from the Post Intervention and Final surveys were also analysed both between the Approaches and collectively for all of the participants. The results of this quantitative analysis is detailed in Section 6 of this report.

4. Description of Project Activity

The PoC successfully delivered Tech Check across the three proposed Approaches: Traditional, Digital Enabled and Full Digital. Details of each of the Approach designs and implementation can be found in their respective sections below.

4.1 Traditional Approach

For the Traditional Approach the Technology Audit was completed in person or over the phone due to Covid-19 restrictions between January and March 2020. Farms began by completing the Consent form and the Pre Intervention survey. They were then asked each of the Audit questions by the researcher with most of the questions allowing for an open-ended answer. The Audit took about an hour to complete, with the in person interviews taking about one and half hours in total. The over the phone interviews took slightly less time but the answers for the questions were just as detailed as the in person ones. As only 2 of the 12 farms completed the Audit over

the phone not enough data was collected to significantly compare the impact of the change.

The Audit answers were then digitised and analysed by Yagro. A one hour call was then arranged with the farm to go through their Technology Audit Report in detail. During the call Yagro went through each of the sections and established which of the Technology Experts the farm would like to speak to. All of the farms were offered 45 minute calls with each of the 5 experts, however, the uptake from the farms differed between the technology areas, as shown in Table 6 below.

Table 6 - Number of Farms that Arranged Calls with the Experts in Each Area (Sample Size: 10)

Technology Area	Number of Farms that spoke to each Expert (Sample Size: 10)
Precision Farming	7
Grain Marketing	7
Benchmarking	4
Finance Software	3
Procurement	2

The Expert calls were arranged by Yagro and once the farm had spoken to all of their chosen Experts they were then asked to complete the Post Intervention survey. Out of the 12 farms that initially completed the Audit 10 farms completed the Post Intervention survey, which equates to a completion rate of 83%, and have therefore been included in the quantitative analysis. In June 2020 the farms were then asked to complete the Final Survey, of which 9 out of the 10 farms completed.

The actual cost of the Approach was £8,445 (budgeted cost £10,642), which equates to a final per participant cost of £703. The actual cost was primarily lower than the budget due to the participants not taking up the opportunity to speak with all of the experts.

4.2 Digital Enabled Approach

The Digital Enabled Approach was designed as a half-day workshop with the Audit being completed online ahead of the workshop. Smart Survey was used to host the Audit online as it was the only service that could be found that allowed skip logic to be applied to the questions. Within the Audit each of the main questions had a follow up question dependent on the first answer to provide more detail within a multiple choice design. In total the Audit consisted of 146 questions, of which a farm would answer 44 main questions across the 7 technology areas with the additional follow up questions for each answer. Due to the multiple choice design of the online Audit it was able to be completed by farms quicker on average than the Traditional Approach.

Two half-day workshops were offered in January 2020 at the following locations:

- 23rd January 2020 - Farm 491, Cirencester ([Eventbrite page](#))
- 30th January 2020 - Eagle Labs, Cambridge ([Eventbrite page](#))

Each of the workshops was designed for 8 farms to attend on the day and was advertised as a free event through Eventbrite. Unfortunately due to a local funeral on the day of the Cirencester workshop and due to good weather on the day and another event running on the same date as the Cambridge workshop we were not able to achieve the proposed numbers. The Cirencester workshop had 6 farms attend on the day and the Cambridge event had 6 farms signed up but only 4 were able to attend on the day. Each of the farms were given hard copies of their personal Technology Audit Reports at the workshops.

The following timetable was used for each event:

- 8:30 arrive with Tea and Coffee
- 9am Start
- 9:00 – 9:15 Introduction
- 9:15 – 10:15 Daniel Kindred – Precision Farming
- 10:15 – 10:45 Bryony Parker – Financial/Accounting
- 10:45 – 11:00 Tea and Coffee Break
- 11:00 – 11:45 Daniel Jolly - Procurement
- 11:45 – 12:30 James Bolesworth – Grain Marketing and Risk
- 12:30 – 13:15 Giles Blatchford – Benchmarking
- 13:15 – 14:00 Closing Remarks and Lunch

Unfortunately due to a virus, Bryony Parker was not able to present at the Cirencester workshop. Other than this slight change both events worked very well and we received very positive feedback from the farms on the day. We found that the Precision Farming talk overran on both occasions as this is one of the most complicated areas of farm technology and time would likely need to be increased for this section for future workshops. At both of the events the talks continued into lunch, however this did not seem to take away from the atmosphere and learnings. Informal qualitative feedback from the farms showed that all of the participants felt that the half-day format worked well as they were able to attend for the morning and then return to the farm to complete their outstanding tasks in the afternoon. At the end of each of the workshops the farms completed the Post Intervention survey on paper. As they completed the survey on the day, all of the farms within the approach are included in the quantitative analysis, although due to the initial drop outs the completion rate is classed as 77%. In June 2020 the farms were then asked to complete the Final Survey, of which 9 out of the 10 farms completed.

The actual cost of the Approach was £11,867 (budgeted cost £11,616), which equates to a final per participant cost of £1,187. The per participant cost was greatly affected by the lower number of participants (10 vs 16) as the majority of the costs to run the workshops were independent of the number of farms that attended.

4.3 Full Digital Approach

For the final Approach, Full Digital, Yagro aimed to recruit 97 farms. Two advertising campaigns in Farmers Guardian and Farmers Weekly respectively were used to promote the approach and 112 farms were contacted directly. Unfortunately, the advertising campaigns were not very successful as they only produced three farms, one of which did not meet the eligibility criteria. Of the 48 farms that signed up to the

Full Digital Approach only 24 completed the Audit. Yagro contacted the other 24 farms to collect feedback on why they did not complete the Audit and were able to collect feedback from 15 of the 24 farms. Their feedback is included in Section 6 of the report along with feedback from 12 farms that declined to be involved in the Approach.

The Technology Audit was completed online by 24 farms and each of the participants received their Technology Audit Report via email, followed up by a phone call from Yagro to inform them their report was ready. The original Approach design consisted of the Technology Experts each delivering 20-35 minute webinars throughout a week in February 2020. However, due the Winter and Spring weather affecting the normal drilling times for the majority of farms, the decision was made to change the format to pre-recorded short educational videos from the Experts which was hosted on the educational course platform, Thinkific. The change in design allowed the farms to access the videos in their own time increasing their ability to participate in the Approach and Yagro was able to measure the engagement of each of the farms across the technology areas. The Technology Audit Report was also amended to include links to each of the videos as part of the individual recommendation sections for each of the farms. An example of the Full Digital specific Report is included in the Appendices.

Farms were asked to complete the Post Intervention survey once they had completed watching the videos that were of interest to them. Of the 24 farms that completed the Audit only 22 farms completed the Post Intervention survey and are therefore included in the analysis, which equates to a completion rate of 46%. In June 2020 the farms were then asked to complete the Final Survey, of which 19 out of the 22 farms completed.

Although the farms were able to access the videos in their own time, of the farms that completed the Post Intervention survey 45% of them did not log in to their platforms and only 23% of them accessed their platforms more than once. Table 7 below shows the average completion rate for each of the Technology Expert areas for the farms that logged in to their platforms at least once (12 of the 22 farms). We were disappointed to find that the engagement rate was low both in terms of logging on and actually watching the videos from the Experts.

Table 7 - Thinkific Average Completion Rate for Farms that Logged in to the Platform (Sample Size: 12)

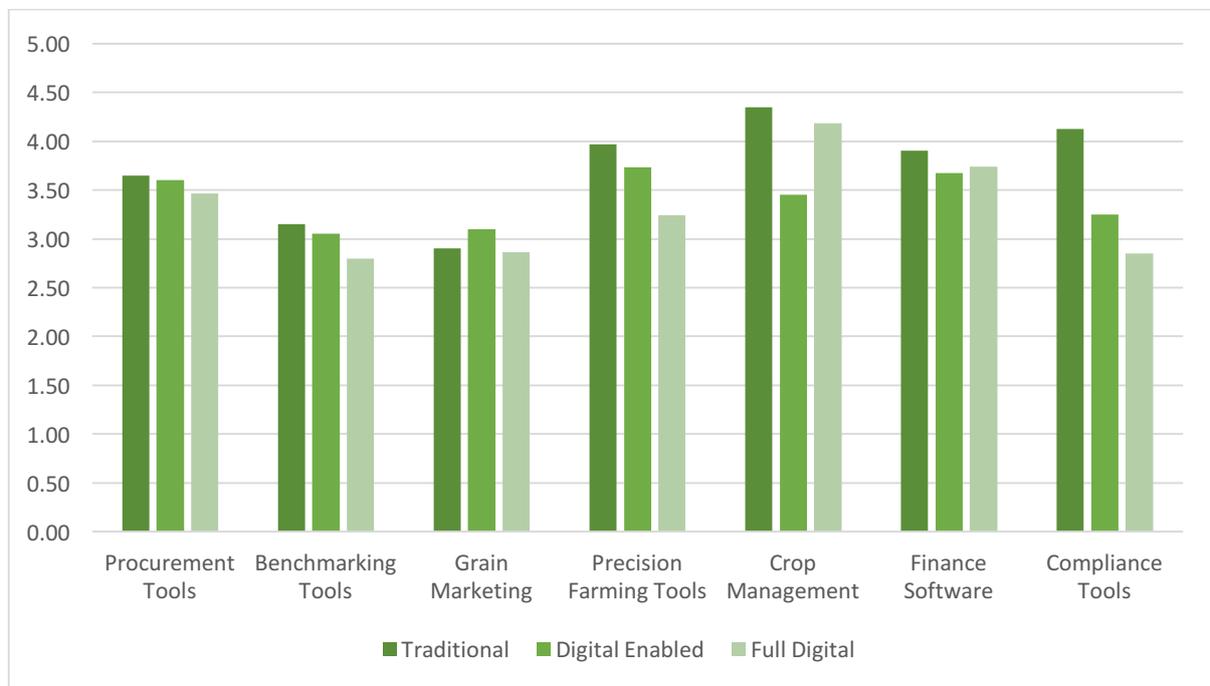
Technology Area	Average Completion Rate
Precision Farming	40%
Procurement	33%
Finance Software	33%
Grain Marketing	21%
Benchmarking	19%

The actual cost of the Approach was £11,633 (budgeted cost £12,243), which equates to a final per participant cost of £485. Although the actual cost was similar to the original budget because of the design changes the labour costs were higher for a smaller number of farms, which therefore increased the cost per participant.

5. Technology Audit and Cohort Summary

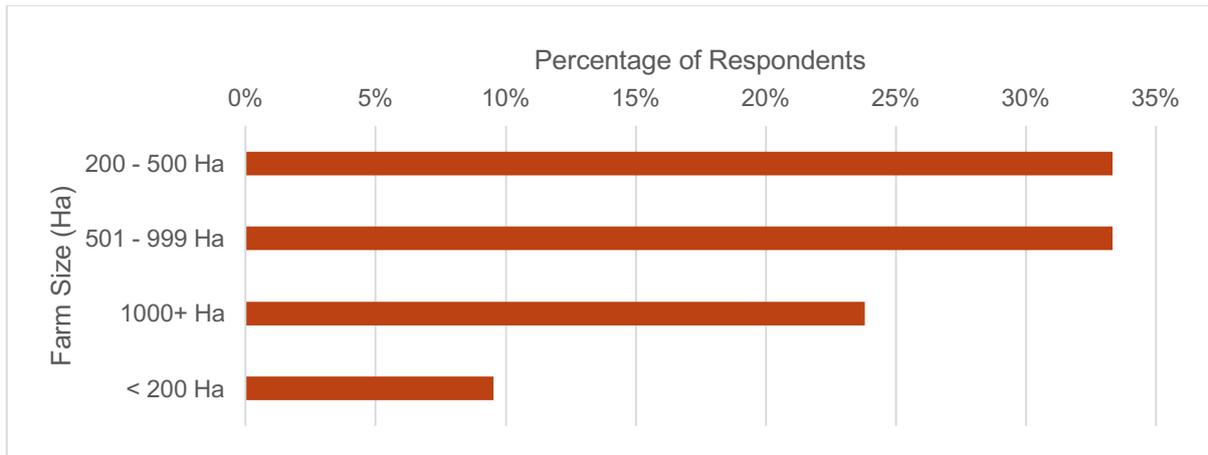
In total the project had 42 English farms complete the Technology Audit and Pre and Post Intervention surveys and were therefore included as the core sample for the analysis. The Technology Audit Report scored each of the farms out of 5 for their technology use in each of the 7 Technology Areas. The results in Figure 2 below, show that Crop Management and Finance Software had the highest levels of adoption across the three Approaches. This result was expected by the researchers with these two areas being the most widely used farm technologies in the industry. Whereas, Benchmarking and Grain Marketing were the least used technology areas on average. The Traditional Approach participants had the highest overall average Adoption Score of 3.72, followed by the Digital Enabled Approach with 3.41. The Full Digital Approach participants had the lowest average score of 3.31.

Figure 2 - Average Technology Adoption Score by Technology Area (Sample Size: 42)



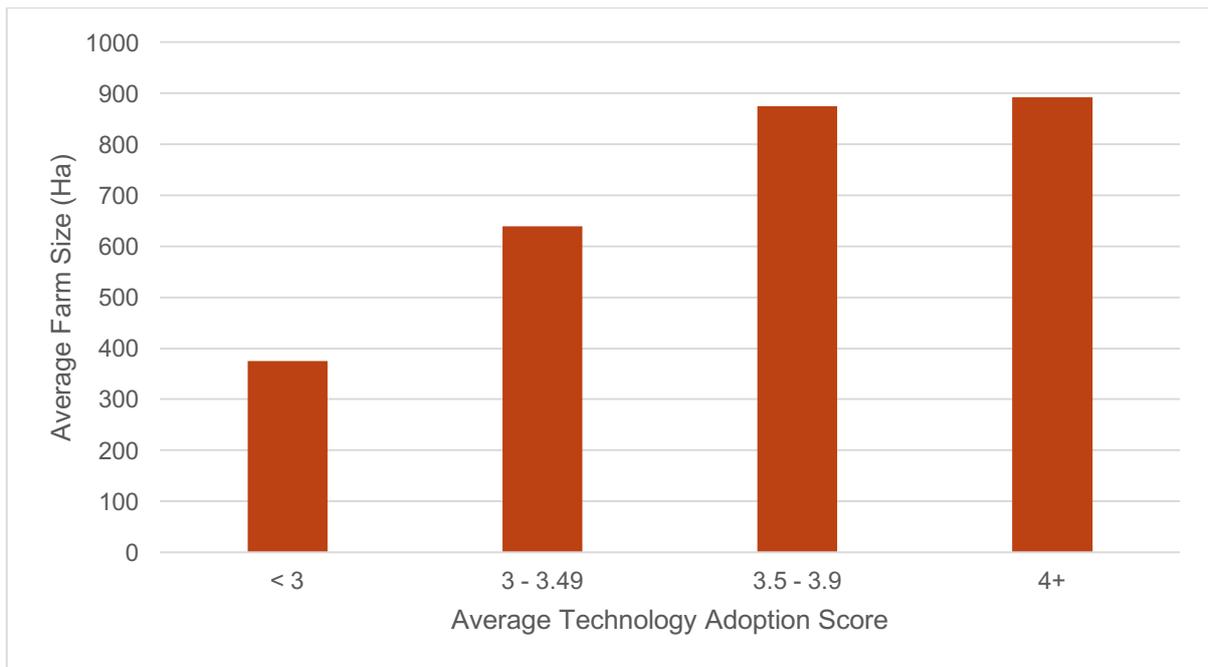
As part of the Audit we collected general management information from each of the farms, this aggregated analysis is included in the Appendices. The farms ranged in size between 132 – 1700 Ha with 66% of farms between 200 – 999 Ha.

Figure 3 - Arable Size (Ha) of Sample Farms (Sample Size: 42)



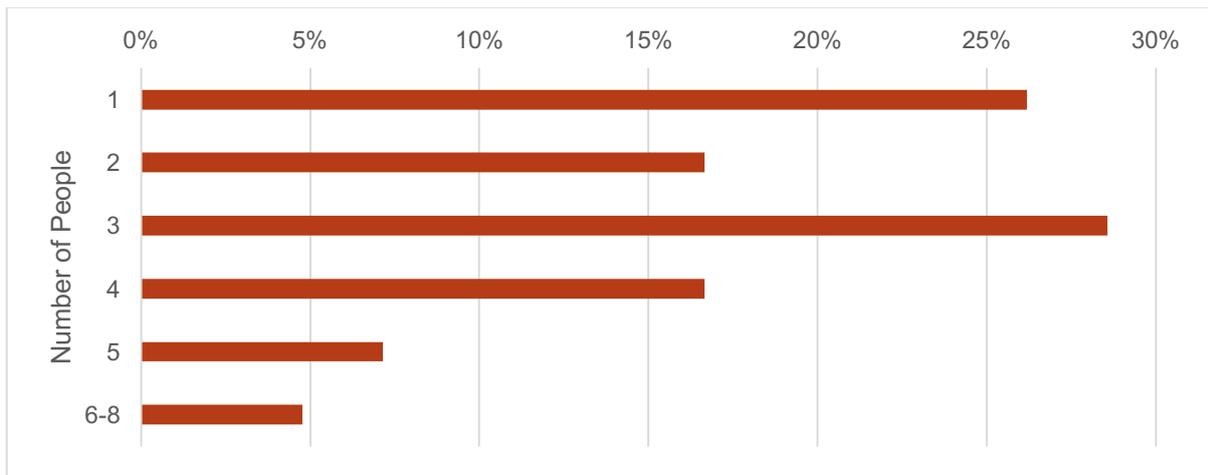
When comparing a farm’s size and their overall Technology Adoption Score, we found that the larger farms had a greater level of technology adoption on average as shown below in Figure 4.

Figure 4 - Average Technology Adoption Score by Farm Size (Ha) (Sample Size: 42)



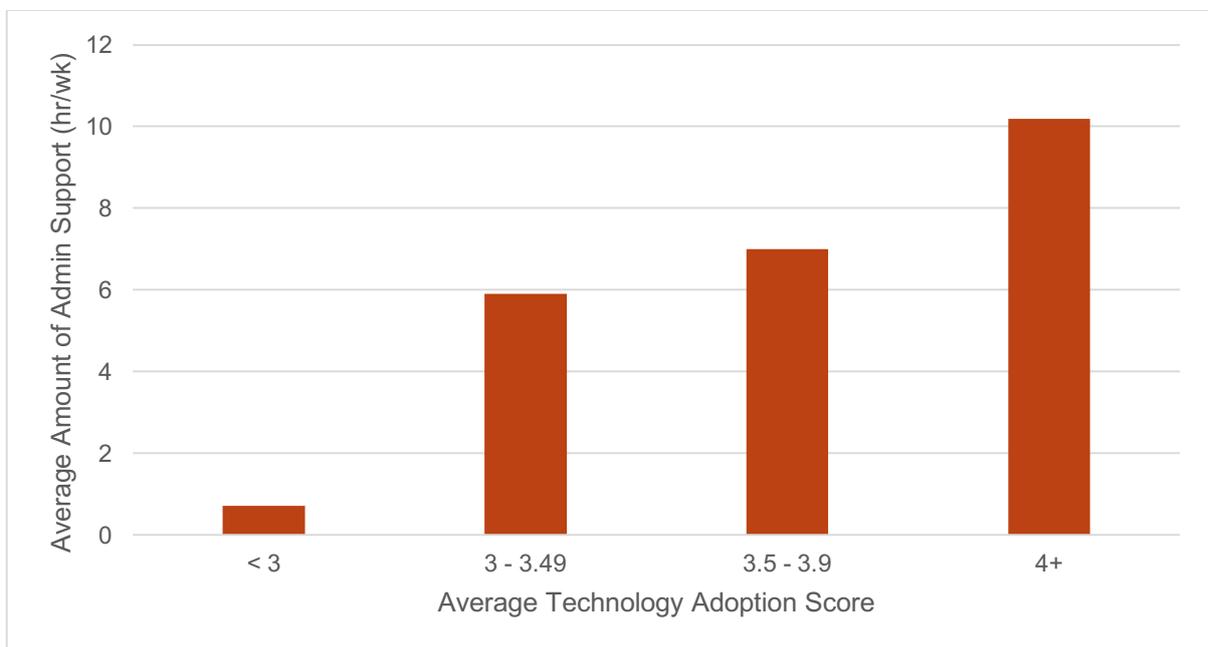
As part of their farm setup, 74% of the farms were multi-site, with an average distance of 11 miles between sites. The majority of farms had between 1-3 full time equivalent staff, including the farm manager/owner (Figure 5).

Figure 5 - Number of full time equivalent farm staff of sample farms (Sample Size: 42)



We also recorded how many hours of administration support the farm employed per week to help them record and process their data and accounts, 31% of the farms had zero hours of administrative support, with only 16% of farms having more than 11 hours of support a week on average. When comparing this to their overall Technology Adoption Score we found the farms that had an overall score of less than 3 had significantly less support than the farms that scored a 4 or above, as shown in Figure 6 below.

Figure 6 – Technology Adoption Score Compared to Farm Admin Support Amount (Sample Size: 42)



The sample farms' average yield for Wheat ranged between 8.2-12 tonnes/Ha with an overall average of 9.3 tonnes/Ha. Their cost of production for Wheat was also recorded, however, due to clear differences in how each of the farms calculated their cost of production the figures varied too widely to be able to analyse accurately with some farms providing only variable costs or no figure at all.

6. Quantitative Analysis of Outcomes & Impacts

The data from the Pre Intervention, Post Intervention and Final surveys has been compared to assess whether participants knowledge, attitudes and behaviours had changed after the intervention from what they were before participating in the three Tech Check Approaches. The charts below compare the three Approaches against each other to show the extent of the change¹. Concluding with analysis of the Tech Check service, further support required and feedback from the farms that did not complete the Audit or declined to be involved.

Pre and Post Intervention Treatment Group sample size:

- 10 Traditional Approach farms
- 10 Digital Enabled Approach farms
- 22 Full Digital Approach farms

Final Survey Treatment Group sample size:

- 9 Traditional Approach farms
- 9 Digital Enabled Approach farms
- 19 Full Digital Approach farms

Confirmed Participants that did not complete the Audit sample size:

- 15 Full Digital Approach farms

Farms that declined to participate sample size:

- 12 Full Digital Approach farms

6.1 Immediate Outcome Measures

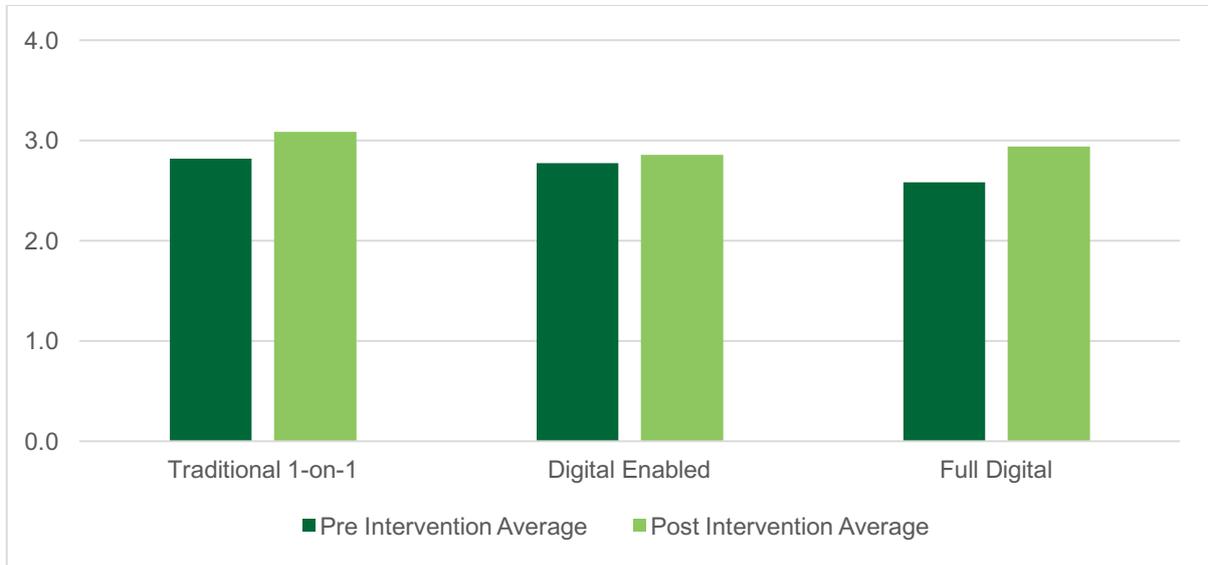
As described in Section 3, the surveys were designed to collect quantitative data on the Outcome Measures described in the project Logic Model in Figure 1. The charts below show the results of the analysis of the 'pre and post' and 'pre and final' average scores for the 7 technology areas for all of the Approaches on the following Outcome Measures:

- Knowledge/awareness of the listed farm technology areas.
- Perception of the usefulness of the farm technologies to help achieve their business objectives.
- Ability to decide whether to adopt new farm technologies within each area or not.

¹ The answers on the Likert scales that were used in the surveys were allocated a score from 0-4 (e.g. No awareness – 0 to Full awareness – 4) for each of the questions. For each question an average was then calculated from the 7 Technology Area scores for the Approach groups. The Approach percent change described in the analysis text is a comparison between these averages for each of the survey questions (e.g. Pre and Post Survey or Pre and Final Survey).

6.1.1 Outcome on participant's 'Awareness' of Farm Technology

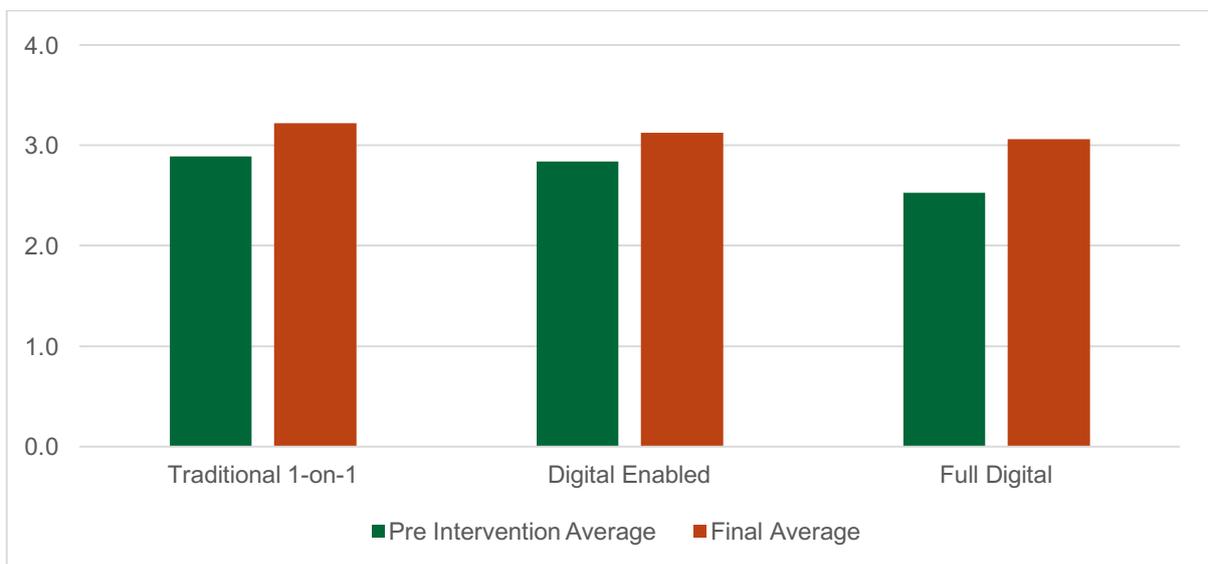
Figure 7 - After completing Tech Check what level of awareness do you now have of the following tools? (Post Intervention Sample)



Each of the Approaches had a marginal impact on the outcome of the participants' level of awareness of farm technology Post Intervention.

- The Full Digital Approach showed the largest increase in awareness on average, with 14%.
- Overall participants' had above a basic level of awareness prior to participating in Tech Check (3 = good level of awareness) across all three Approaches.
- In regards to the different Technology Areas, the biggest increase in awareness was amongst Compliance Tools with a 38% increase across the three Approaches, with the Full Digital Approach showing the largest increase of 45% for this area.

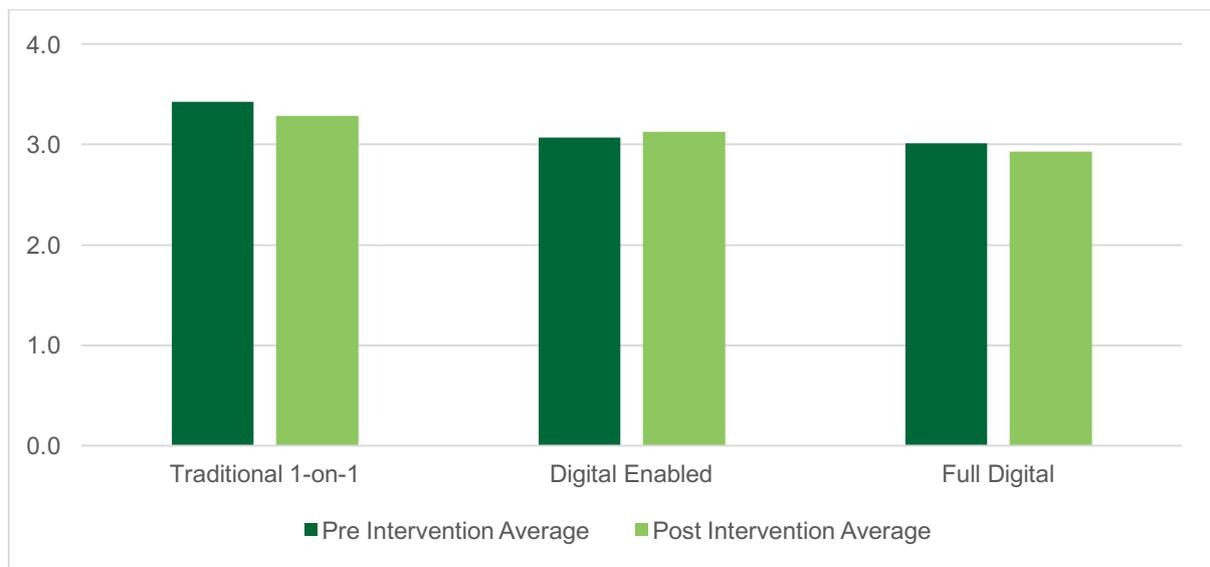
Figure 8 - After completing the Tech Check process and having investigated your recommendations, what level of awareness do you now have of the following tools? (Final Survey Sample)



After the Final survey the participants Awareness scores increased again, with all approaches increasing above a score of 3 which is a 'Good Awareness' level. Once again, the Full Digital Approach showed the biggest increase with 21% and interestingly the Traditional Approach showed no score increase compared to the Post Intervention survey.

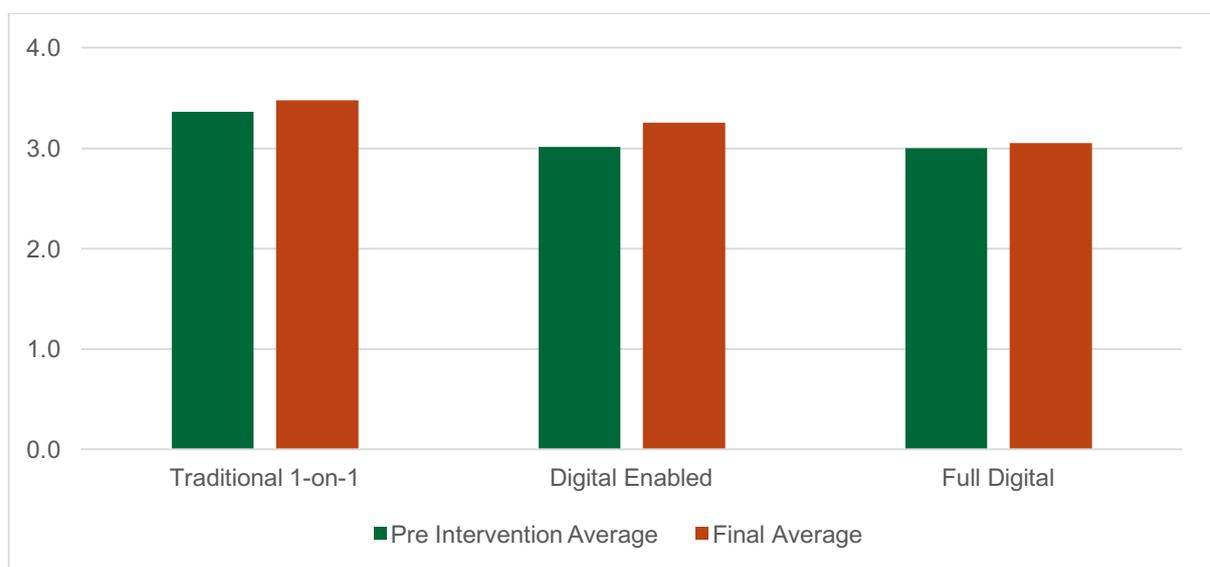
6.1.2 Outcomes regarding 'Perceived Usefulness' of Farm Technology

Figure 9 - Now that you have completed Tech Check to what extent do you think the following tools and software can help you achieve your farm objectives? (Post Intervention Sample)



The Post Intervention survey showed no meaningful change in the participants view of the perceived usefulness of the farm technologies to help them achieve their farm objectives.

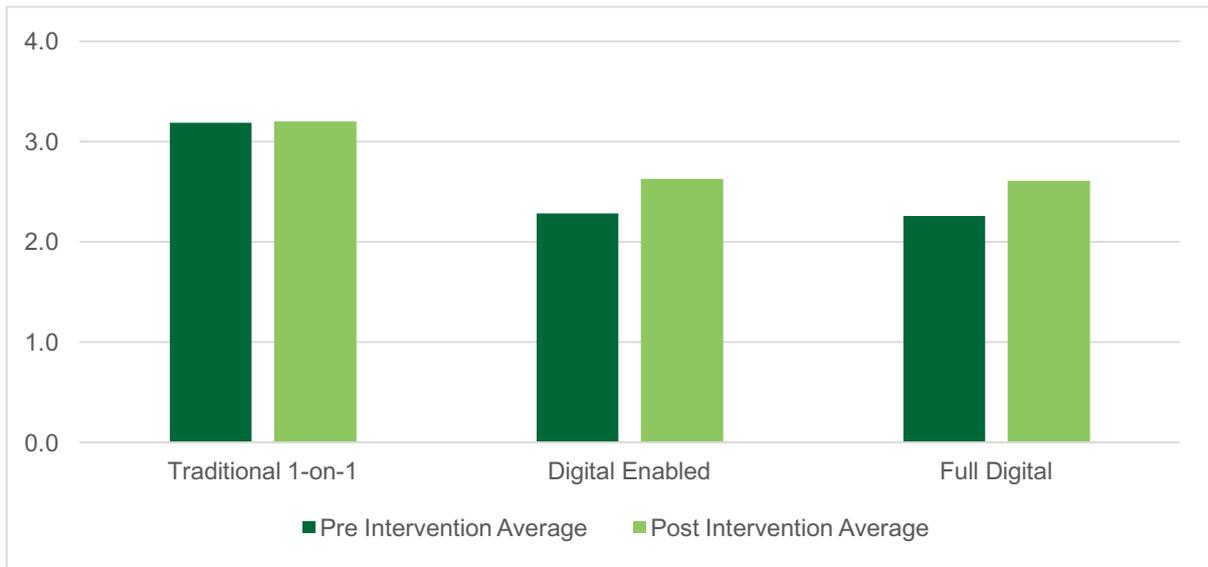
Figure 10 - To what extent do you now think the following tools and software can help you achieve your farm objectives? (Final Survey Sample)



However, by the time the participants completed the Final Survey their perceived usefulness of the technology had increased across all three of the Approaches, with the Digital Enabled Approach showing the largest increase of 8%.

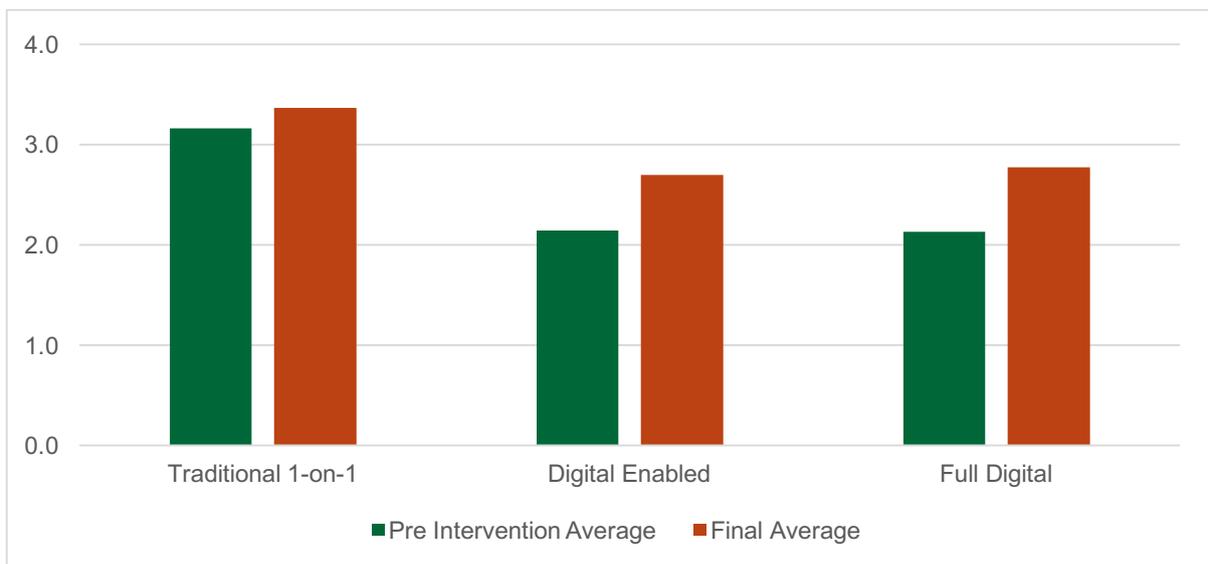
6.1.3 Outcome on participants 'Ability' to decide whether to adopt Farm Technology

Figure 11 - After completing Tech Check how capable do you now feel of deciding whether to adopt the following tools for your business? (Post Intervention Sample)



The participant's confidence in their ability to make informed decisions on whether to adopt the farm technology increased in both the Digital Enabled and Full Digital Approaches. The participants confidence did not change for the Traditional Approach farms, however their overall level of ability was higher than the other two Approaches, meaning they already felt 'Fully Capable' (score of 3).

Figure 12 – How capable do you now feel of deciding whether to adopt the following tools for your business? (Final Survey Sample)



The Final survey showed a more significant increase in the participant’s confidence across all three of the Approaches. The largest change was Full Digital, with a 30% increase moving them closer to ‘fully capable’. The Traditional Approach continued to achieve the overall highest ability level.

6.2 Intermediate Impact Measures

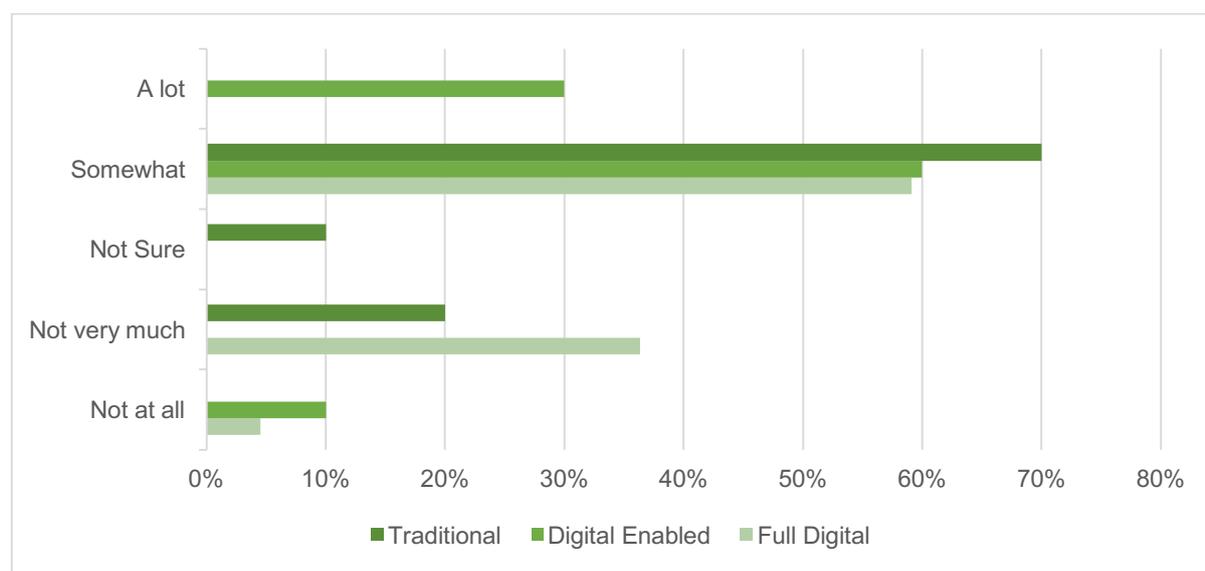
The surveys also sought to collect quantitative data on the Intermediate Impact Measures, although there was recognition that due to Covid-19 the farms may not have been able to adopt/implement some of the recommendations from their Audit Reports prior to completing the Final survey. The wording on the Final survey was therefore amended to capture this impact.

The Intermediate Impact Measures were identified as:

- Change in technology awareness and adoption
- The likelihood that they will adopt one or more of the Audit recommendations.
- Implementation of their Technology Audit recommendations.

6.2.1 Impact on participants view of adopting new Farm Technology

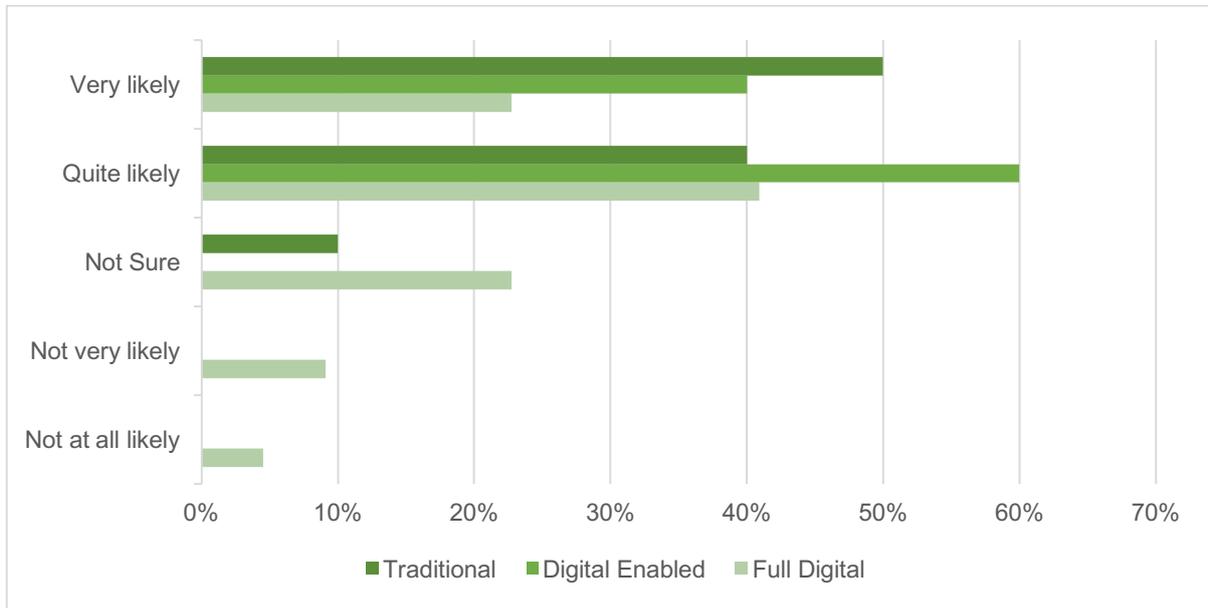
Figure 13 - To what extent has Tech Check changed your view about adopting new farm technologies for your business? (Post Intervention Sample)



We had positive feedback across all three Approaches, with 90% of the farms in the Digital Enabled Approach saying that we had changed their view of adopting new technologies either ‘Somewhat’ or ‘A lot’. The only Digital Enabled farm that stated we did not change their view added a note to state that they were “Already open and enthusiastic” and therefore would be classed in the Openness category of the BEIS Adoption Framework. The Traditional Approach was able to change the view of 70% of the farms and the Full Digital still had a slight majority of 59% of participants stating the intervention had ‘Somewhat’ changed their view. As such, the Full Digital was the least effective with 41% of the farms stating ‘Not very much’ or ‘Not at all’.

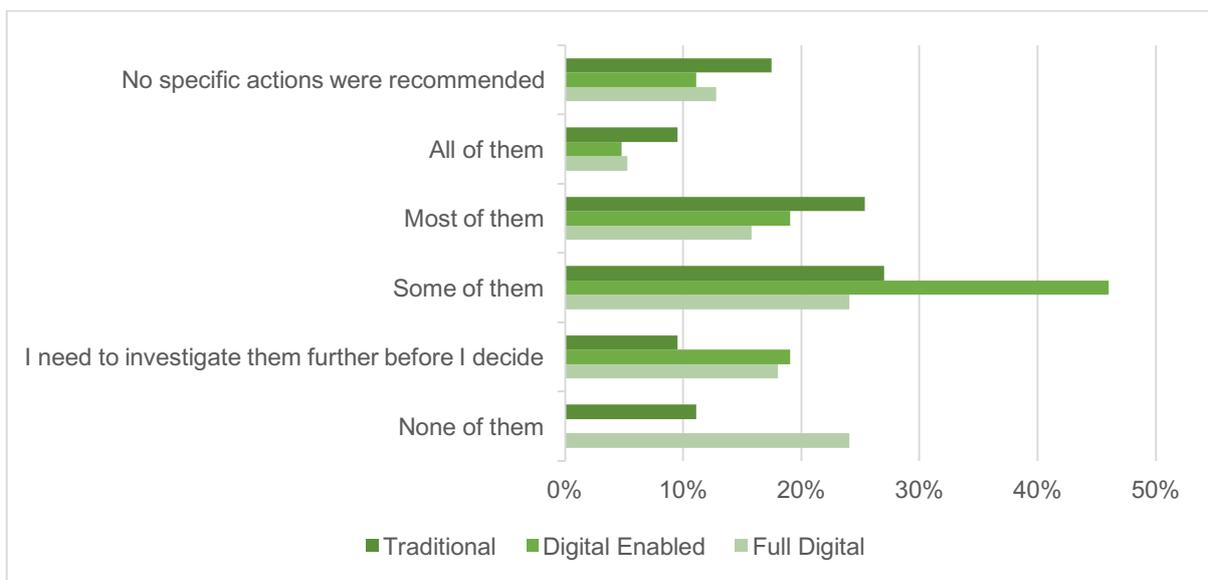
6.2.2 Impact on participants adoption of Technology Audit Report recommendations

Figure 14 - How likely is it that you will adopt/implement one or more of the recommendations from your Technology Audit results in the next 12-18 months? (Post Intervention Sample)



Initial feedback from the Post Intervention survey showed that the majority of participants were either 'Quite Likely' or 'Very Likely' to adopt one or more of the recommendations they received as part of their Technology Audit Report. The Full Digital Approach had the least impact on farms with 36% of participants either 'Not Sure' or 'Not Likely' to implement the recommendations, which is consistent with the findings in Figure 13, that 41% of the farms stated that Tech Check did not change their views regarding adopting new technologies.

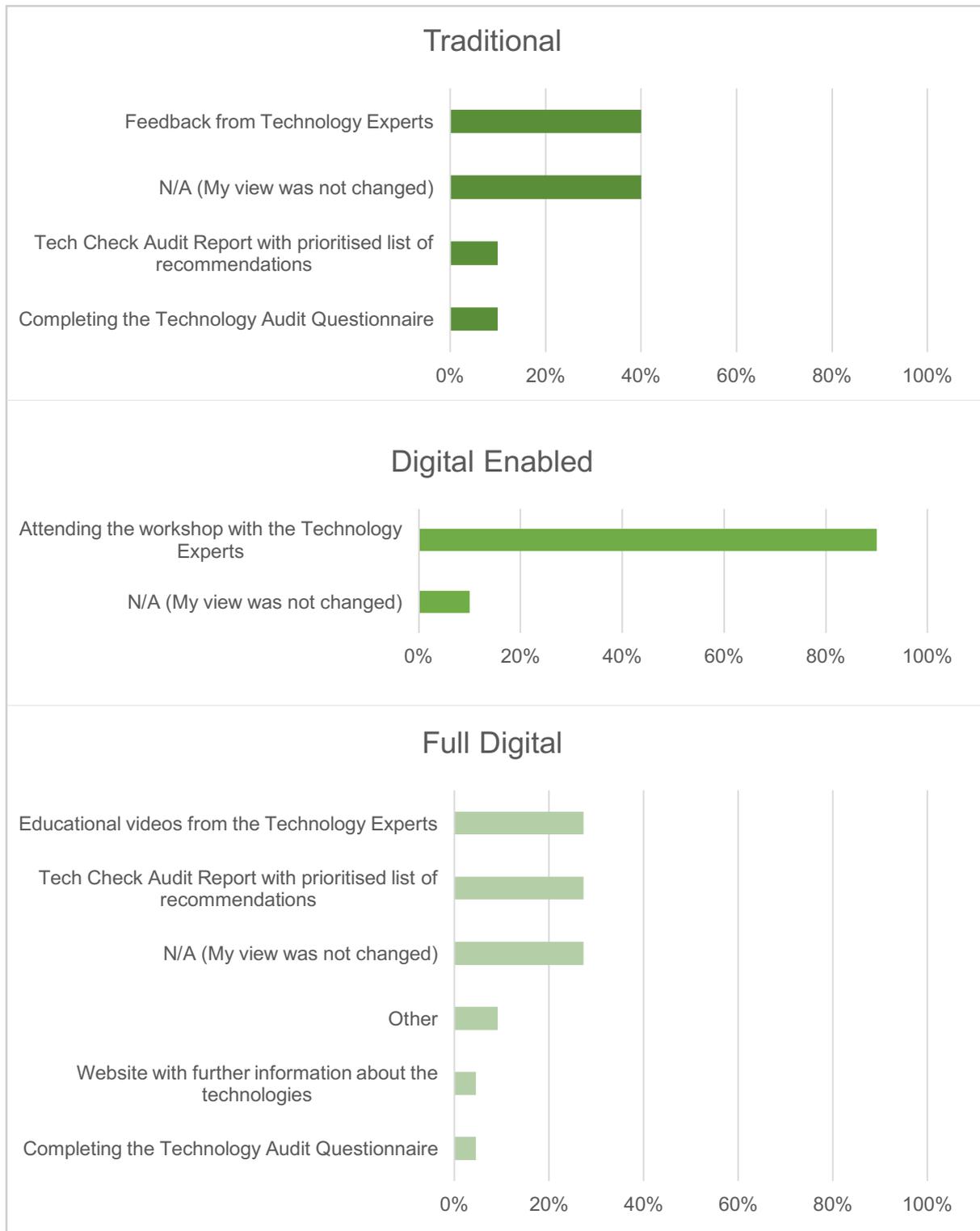
Figure 15 - In each of the areas, how many of the recommendations from your Technology Audit or from advice you received from the Experts have you implemented or intend to implement in the next 12-18 months? (Final Survey Sample)



As part of the Technology Audit Report if the farm was already using the recommended technology in the area analysed, they were not given specific recommendations. For all of the other areas the farms received a list of recommendations for each of the 7 Technology Areas. Again the participants in the Digital Enabled Approach showed the highest overall level of implementation with 70% of farms implementing or intending to implement some, most or all of their recommendations. The Full Digital Approach had the highest percentage of participants to choose to not implement the recommendations within the 7 Technology Areas, with an average of 24%.

6.2.3 Impact on participants overall view of adopting new Farm Technology

Figure 16 - If your view about adopting new farm technologies has changed, which aspect of Tech Check contributed most to this? (Post Intervention Sample)

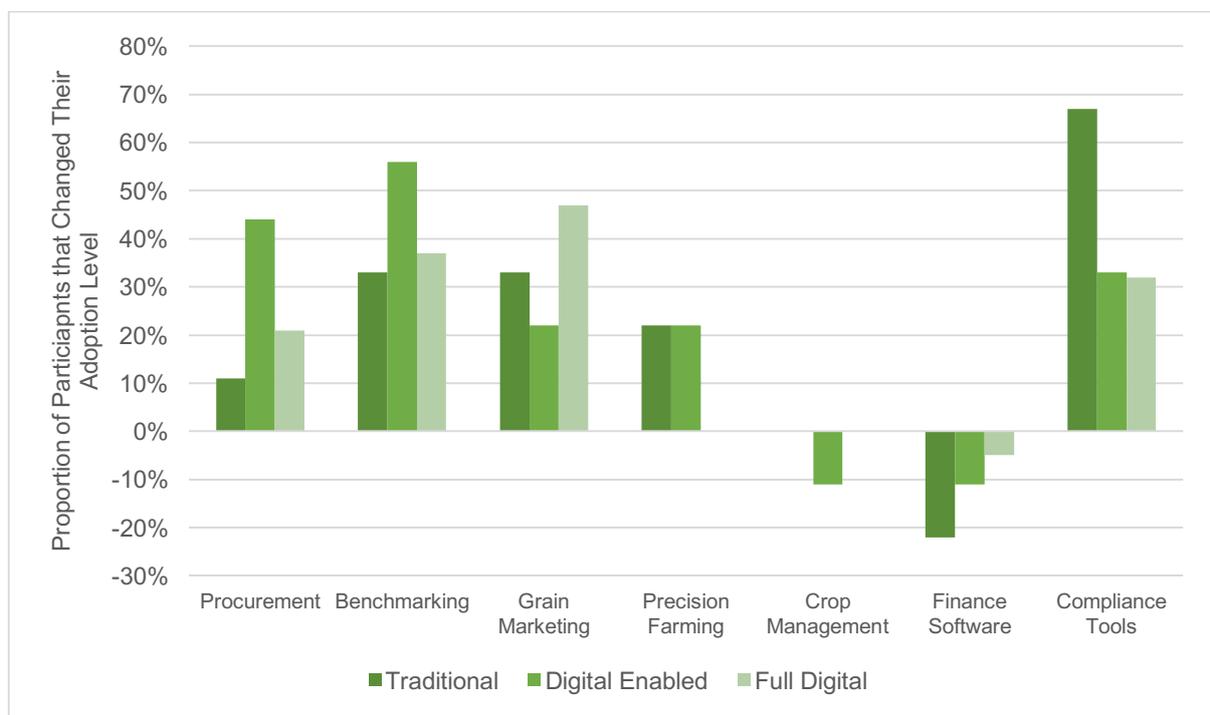


When comparing the three Approaches in their ability to change the participant's view of adopting new technologies, it was clear that the interaction between the participants and the Technology Experts in the various forms had the greatest

impact. The Digital Enabled Approach had the most significant result with 90% of farms stating the workshop was the biggest influencer. It is worth noting that by selecting 'Attending the workshop with the Technology Experts' this would include both their interaction with the Experts and the other farmers. Qualitative informal feedback from the Digital Enabled participants suggested that the conversations with the other farms was certainly a beneficial factor of the workshop as they were able to get real world feedback from other farms using the technologies. In contrast, 40% of the Traditional Approach farms and 27% of the Full Digital farms stated that their views were not changed.

6.2.4 Impact on participants level of adoption of Farm Technology

Figure 17 – Proportion of Participants that Increased or Decreased their Level of Adoption for the 7 Technology Areas, when Comparing their Pre Intervention and Final Survey Answers for the question: For the tools that you have previously or recently adopted, what is your level of adoption? (Final Survey Sample)



To determine if the level of adoption of the participants changed from completing the Approach, the Pre Intervention and Final Survey answers were compared for each participant to see if their adoption level increased, decreased or had no change for each of the technology areas². All three of the Approaches successfully increased the participants' overall level of technology adoption, proving the first PoC hypothesis. The Digital Enabled Approach was the most successful of the three as a

² This was calculated by allocating each participant's comparison a numerical representation:

- 1 - Increased use (e.g. moving from 'Not currently adopted to 'Occasional Use' or 'Strategic for my farm', etc.)
- 0 – No Change (e.g. moving from 'Regularly as they are strategic for my farm' to 'Strategic for my farm', 'A couple of times a year' to 'Occasional Use' or selecting 'Not currently adopted' in both surveys, etc.)
- -1 – Decreased use (e.g. moving from 'Regularly as they are strategic for my farm' to 'Occasional Use', etc.)

net 22% of participants increased their level of adoption, on average across the 7 Technology areas. Out of the 5 areas which had Technology Experts (Procurement, Benchmarking, Grain Marketing, Precision Farming and Finance Software), only the Finance Software section saw a marginal decrease in the level of adoption for some of the participants. As this area had one of the highest adoption levels (as shown in Table 8 below) prior to the intervention we believe the decrease is linked to a change in perception of the software for the participants after speaking to the Finance Expert.

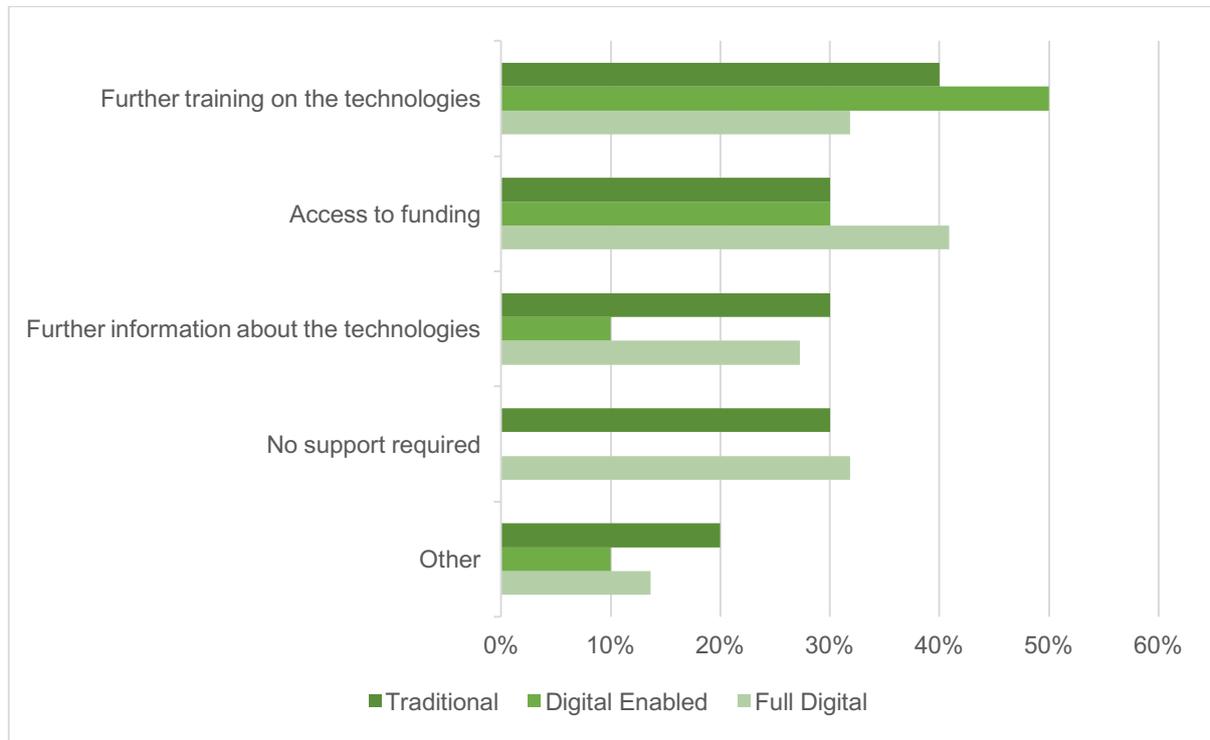
As part of analysing the change in adoption we also measured the percentage of participants that used the technology regardless of the “level of adoption, i.e. Strategic, Occasional Use, etc.”. The initial level of adoption and change in adoption varied between the 7 Technology Areas, as can be seen in Table 8 below. Overall Finance Software and Precision Farming Tools were the most used of the Technology Areas. The area with the highest change in adoption was Compliance tools, which had an average increase across all three Approaches of 37 percentage points. For many farms their recommendation was to sign up to free Compliance and Health and Safety reports which obviously has a lower barrier of adoption than many of the other technology areas.

Table 8 – Percentage of Participants that used the Technology tools across the 7 Technology Areas. Based on the question: For the tools that you have previously or recently adopted, what is your level of adoption? (Final Survey Sample)

Technology Area	Percentage of Participants that Use the Technology	Traditional	Digital Enabled	Full Digital
Procurement	Pre Intervention	78%	44%	53%
	Final Survey	100%	89%	74%
	<i>Change</i>	+22%	+44%	+21%
Benchmarking	Pre Intervention	89%	56%	68%
	Final Survey	100%	89%	79%
	<i>Change</i>	+11%	+33%	+11%
Grain Marketing	Pre Intervention	56%	67%	53%
	Final Survey	89%	89%	79%
	<i>Change</i>	+33%	+22%	+26%
Precision Farming	Pre Intervention	100%	89%	84%
	Final Survey	100%	100%	84%
	<i>Change</i>	0%	+11%	0%
Crop Management	Pre Intervention	89%	89%	89%
	Final Survey	89%	89%	95%
	<i>Change</i>	0%	0%	+5%
Finance Software	Pre Intervention	100%	100%	84%
	Final Survey	100%	100%	89%
	<i>Change</i>	0%	0%	+5%
Compliance Tools	Pre Intervention	44%	22%	47%
	Final Survey	100%	56%	68%
	<i>Change</i>	+56%	+33%	+21%

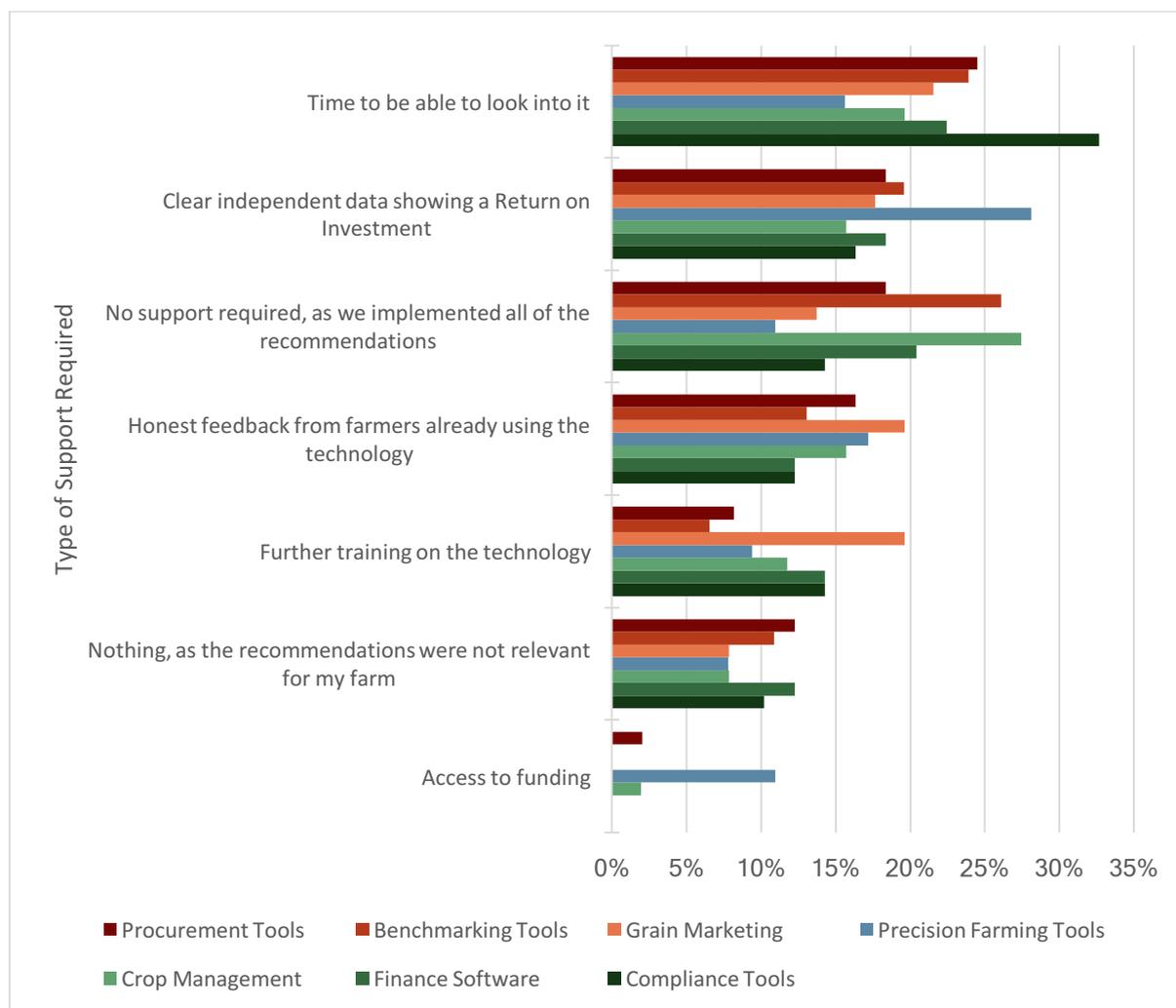
6.3 Further Support Analysis

Figure 18 - What further support do you need to adopt/implement the recommendations from your Technology Audit? (Post Intervention Sample)



The Post Intervention survey aimed to capture details regarding further support the participants required to implement the recommendations that they had received as part of the Audit Report. The 'Other' answers from the survey made it clear that support was very dependent on the area of technology, as such, we amended the Final Survey to better capture the information related to each of the areas, as can be seen in Figure 19 below.

Figure 19 - For the recommendations that you do not plan to implement in the next 12-18 months, what further support/information would help you to implement them in the future? (Final Survey Sample)

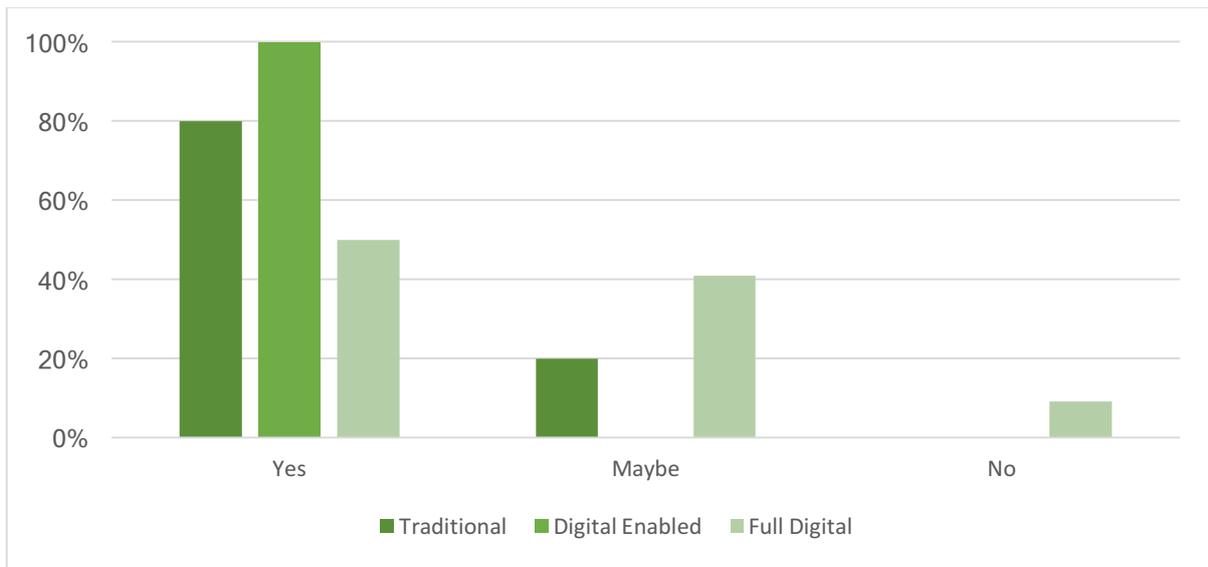


In the Final Survey we captured specific feedback for each of the 7 Technology Areas to be able to analyse if the support needed varied between them. For the recommendations that were not implemented or intended to be implemented by the participants it was clear that the support required varied greatly between the Technology Areas. Adoption of the Precision Farming recommendations were shown to need the greatest level of support and as such had the lowest implementation. Precision Farming Tools require significant investment and clear Return on Investment data is not as widely available as other areas, as can be seen in the feedback from the farms in Figure 19.

6.4 Tech Check Service and Cost Analysis

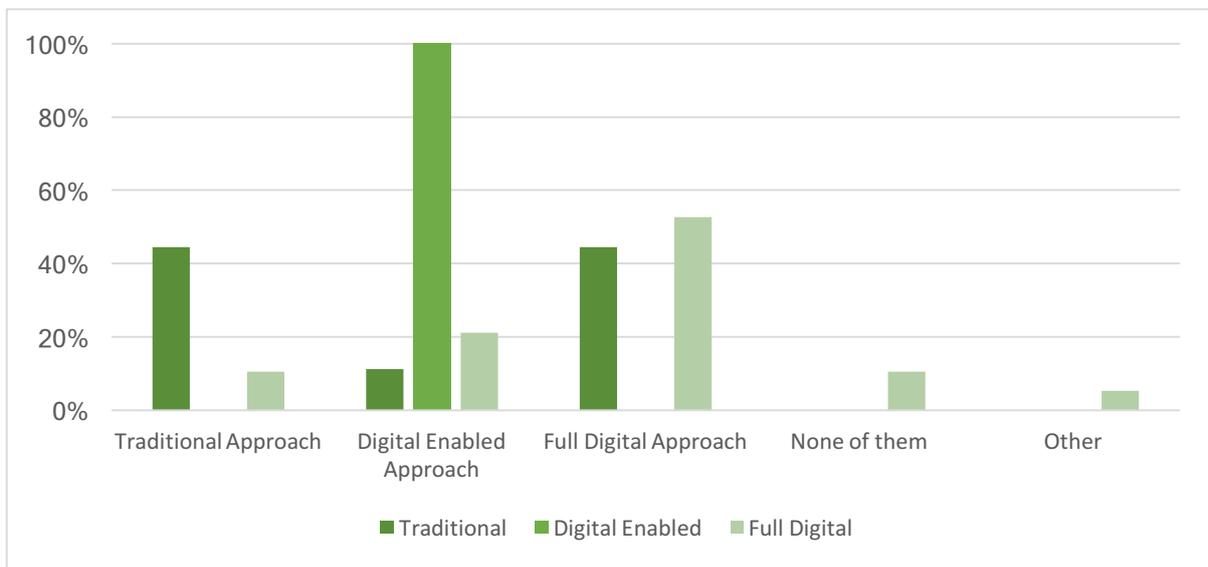
To investigate the second PoC hypothesis relating to the economic viability of offering the Approaches as a service, a series of questions relating to the value of each Approach and how much participants were willing to pay were included in both follow up surveys. Details of the findings are laid out below.

Figure 20 - Would you recommend Tech Check to other farms? (Post Intervention Sample)



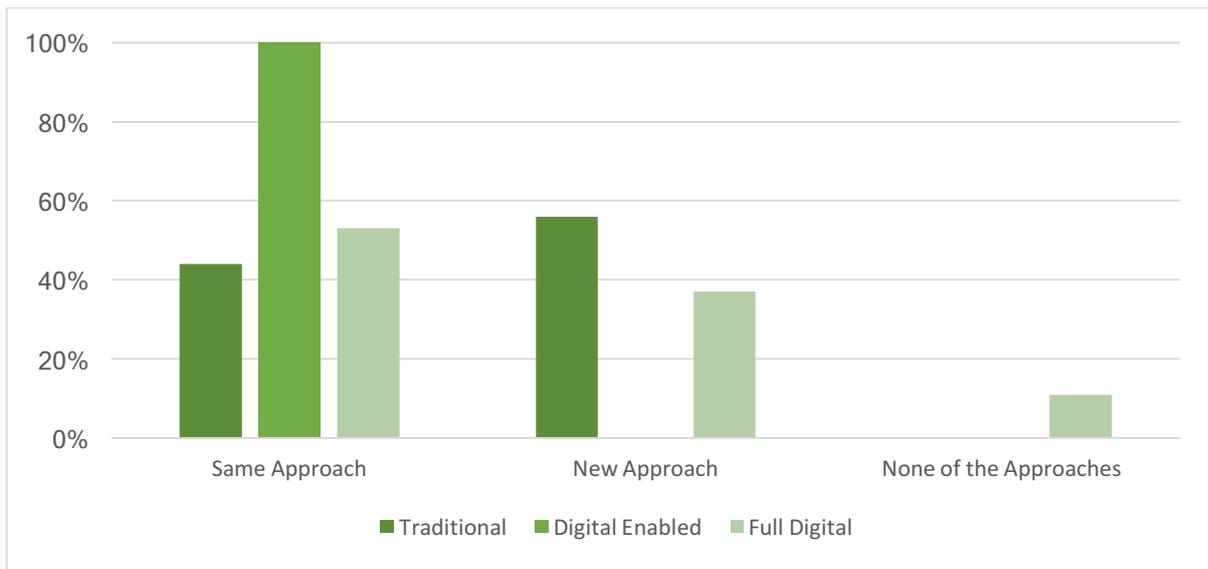
Feedback from the Post Intervention survey showed that all three of the Approaches would be recommended by a majority of the participants. The Digital Enabled Approach achieved a 100% recommendation, again displaying the value the Approach offered the participants.

Figure 21 - If we were to offer one of the approaches as a service in the future, which one do you feel you would gain the most value from? (Final Survey Sample)



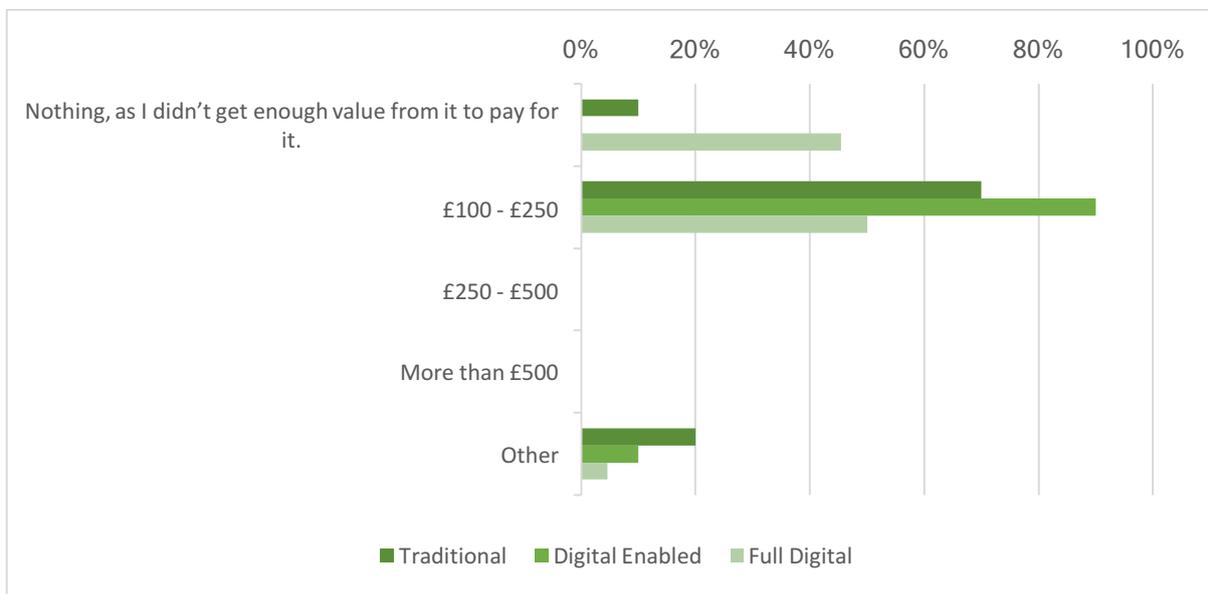
As each of the farms only participated in one of the Approaches, as part of the Final survey we asked which Approach they felt offers the most value regardless of the one they attended. Again the Digital Enabled Approach was the most popular followed by the Full Digital Approach namely due to 44% of the Traditional Approach farms choosing the Full Digital Approach. Only participants from the Full Digital Approach chose 'None of them' or 'Other' as preferences.

Figure 22 - Percentage of participants who chose the same approach as they participated in (Final Survey Sample)



We also analysed the results to see what percentage of participants chose the same approach as the one they participated in. Interestingly, only the Digital Enabled participants chose the same Approach 100% of the time. The Traditional Approach had the biggest change, with 56% of participants choosing a new approach.

Figure 23 - If Tech Check was offered as a service how much would you be willing to pay for it? (Post Intervention Sample)



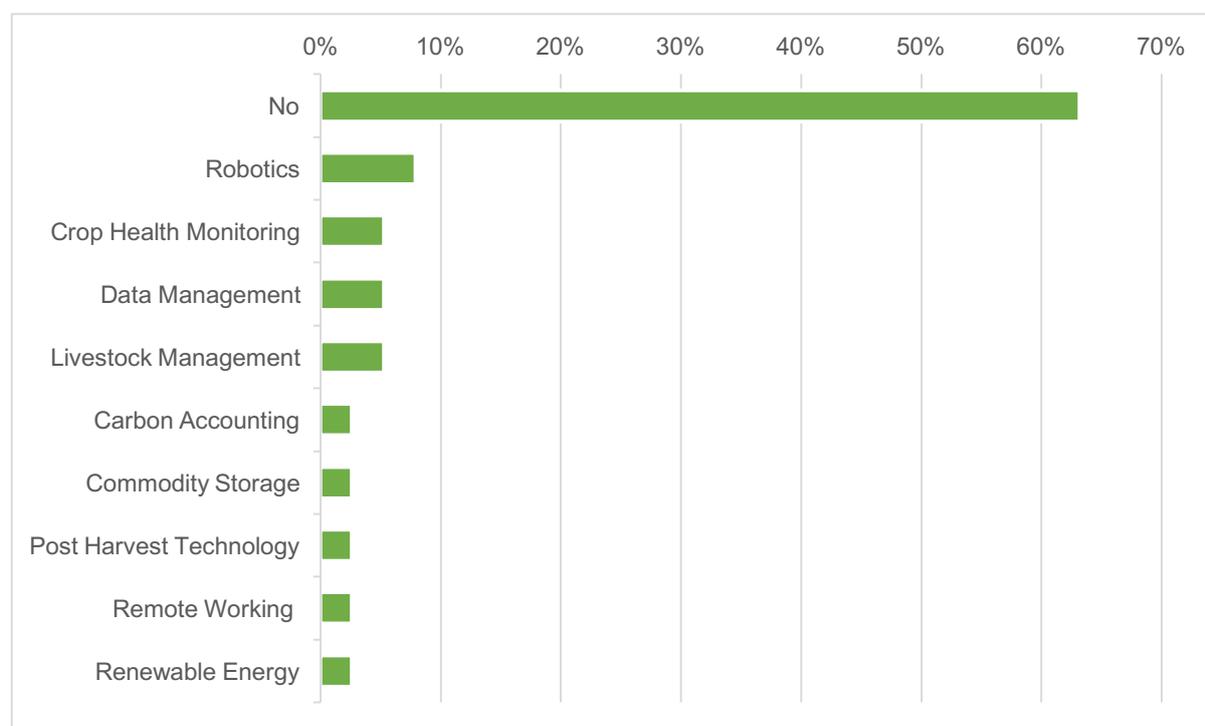
An important consideration of the research was to establish if the farms would be willing to pay for the service if it was offered in the future. The majority of farms across all three of the Approaches stated they would only be willing to pay between £100 - £250. However, 45% of participants in the Full Digital Approach stated they did not gain enough value from the service to pay for it. Therefore, in its current format we would not consider the Full Digital Approach a viable service offering as it does not return appropriate value to the farm or to the service provider.

When analysing the actual costs of offering the Approaches, the per farm cost far exceeds the amount the farms have indicated they are willing to pay. Table 8 below shows the difference between the budgeted and actual cost per participant. Although the design and content for the Approaches has now been created through the PoC, if they were offered in the future as a service in their current format we do not believe the cost to the provider would be able to be reduced low enough to be in line with the participants willingness to pay

Table 8 - Actual Cost vs Budget per Farm

Approach	Budget Per Farm	Actual Per Farm Cost
Traditional	£887 (12 farms)	£703 (12 farms)
Digital Enabled	£726 (16 farms)	£1,186 (10 farms)
Full Digital	£126 (97 farms)	£485 (24 farms)

Figure 24 - Are there any other areas of farm technology you would like us to include as part of Tech Check in the future? (Post Intervention Survey)

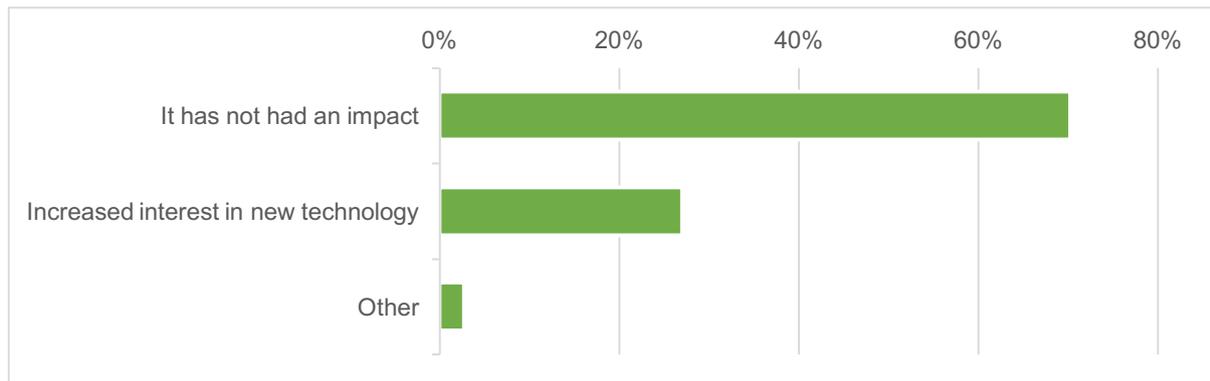


Informal qualitative feedback from the participants throughout the research found that most of the farms felt Tech Check covered the appropriate range of technologies. Figure 24 confirms this, with 63% of participants stating that there were not any other areas they thought we should cover. Some of the more technically advanced farms were interested in other areas, with Robotics being the most popular.

6.5 Covid-19 Analysis

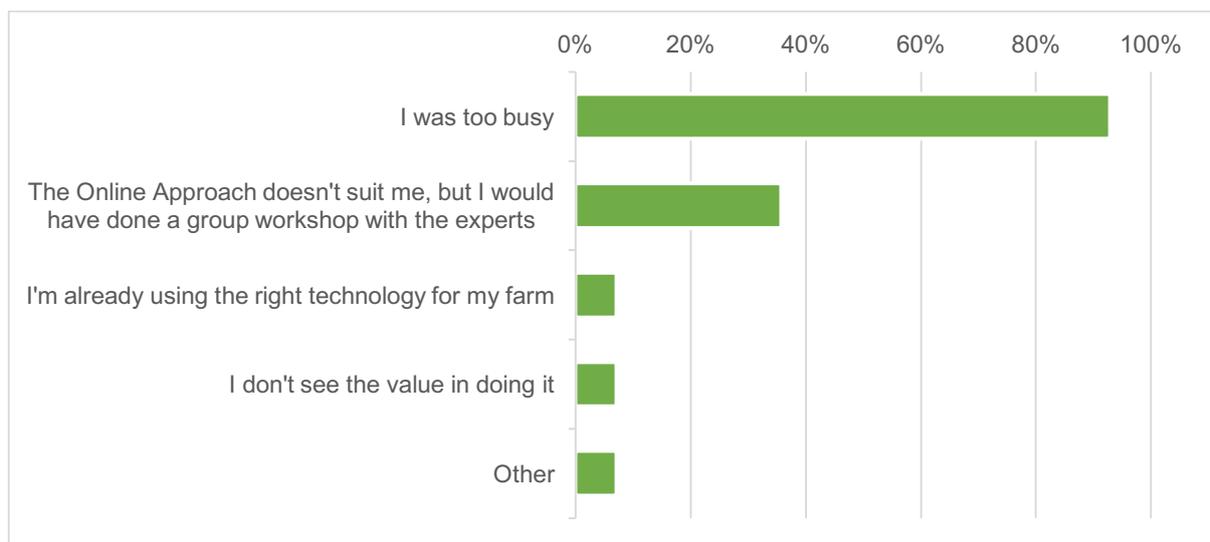
As the PoC was completed during the Covid-19 pandemic, we wanted to assess whether this had an impact on farm's interest in adopting new technology. The majority of farms felt that the pandemic has not had an impact on their willingness, as can be seen in Figure 25 below. None of the farms stated that it had decreased their willingness, with 27% of farms stating that it had increased their interest in new technology.

Figure 25 - How has the current climate created by Covid-19 impacted your willingness to adopt/investigate new technologies for your business? (Final Survey Sample)



6.6 Confirmed Participants that did not complete the Audit Analysis as Part of the Full Digital Approach

Figure 26 - We really appreciate your honest feedback, please select all of the reasons why you are not interested in doing Tech Check (Sample Size: 15)

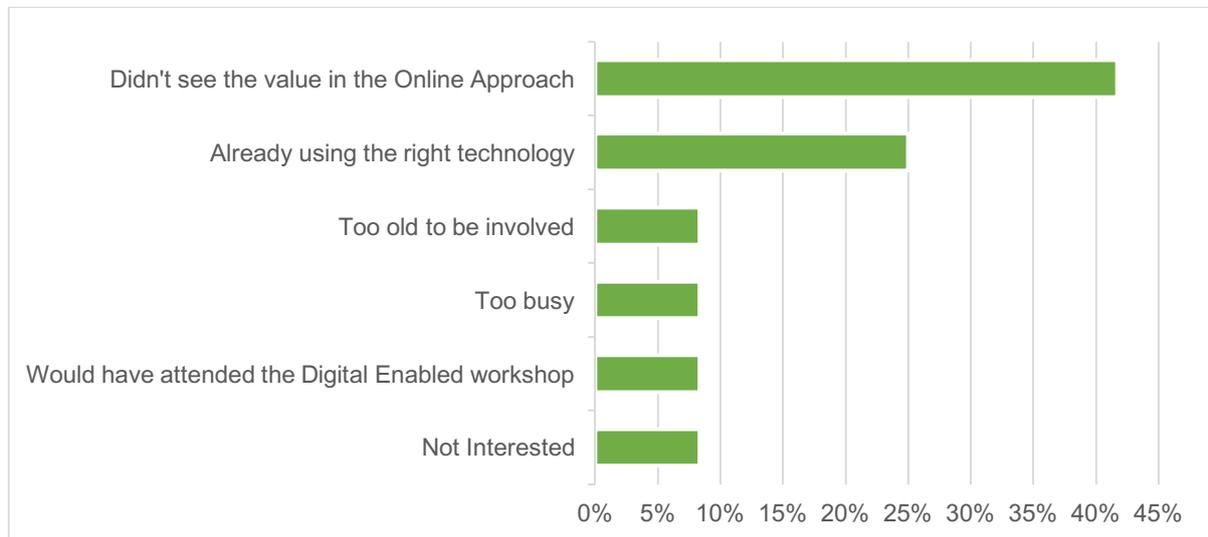


The feedback from the farms that signed up to the Full Digital Approach but didn't complete the Audit shows that 93% of the farms were too busy to complete the Technology Audit. Written feedback from these farms was that they would still like to participate in Tech Check in the future however time commitment is likely to be an

issue for them, highlighting one of the main barriers of adoption we discussed at the beginning of the report.

6.7 Feedback Analysis from farms which declined to be involved.

Figure 27 - Feedback Analysis from farms which declined to be involved (Sample Size: 12)



From the farms that declined to be involved in Tech Check 42% of them didn't see the value in participating in the Full Digital Approach, even though it was offered as a free service. A quarter of the respondents also already felt they were using the right technology for their farm. Interestingly, feedback we received from one of the Full Digital farms stated that "Even if you think you are clear about what you are doing and need, the process (Tech Check) helps you challenge your preconceptions and approaches".

7. Limitations and Lessons Learned

Throughout the PoC we encountered various limitations which impacted the study. First and foremost were the difficulties we experienced in recruiting farms for the project. By using the method of recruitment that we outlined in Section 3.2 bias from the farms may have influenced the results, as the farms that were recruited at the beginning were offered a choice between the Approaches, whereas the farms that were recruited later on were only offered the Full Digital Approach. As some of the farms were able to choose between the Approaches they may have selected the Approach that best suited their learning style.

The direct calling method was the most successful in recruiting farms however this meant that the majority of the participants were from our extended network. The mass marketing approach was very disappointing as only two farms contacted us from the 7,000 arable farms that were emailed through Farmers Guardian and one farm signed up from our front cover full page advert in Farmers Weekly. The free article that was written about the project in Arable Farming was the best Return on Investment with two farms signing up to the Full Digital Approach. As the majority of

farms needed to be contacted directly to sign up, this added a large amount of time and cost to the Labour budget, ultimately impacting when the Approaches were offered and the number of farms we could recruit.

Due to the wet Autumn in 2019 and dry Spring in 2020 the weather affected the Approaches due to farms being busy during what is usually classed as the 'quiet period' of December – February. This impacted the attendance of the Digital Enabled Approach and completion of the Audit for the Full Digital Approach as well as arranging the Expert calls for the Traditional Approach. This would be something to take into consideration for the commercialisation of Tech Check.

During the project we were contacted by the head of the LEADER team in Worcestershire who was very interested in the project and attended the Cirencester workshop. They promoted the workshop as they are also interested in increasing farm productivity. This was an interesting development for the project and again could be explored further in a trial or through commercialisation of the service.

Throughout the project the management and design of the Approaches, particularly designing the Technology Audit, was much more labour intensive than was originally expected. Now that the basic design of the Audit and each of the Approaches has been established the cost of running the Approaches could be reduced to make them more economically viable. Costs for the Traditional Approach could be reduced by completing the Audit over the phone and now that the videos for the Full Digital Approach have been created the cost for running this Approach would also be less, although some of the videos would need to be redone prior to offering it commercially. However for the most successful approach, Digital Enabled, in order for the workshops to be economically viable for Yagro, the cost per farm would need to be reduced substantially based on the payment feedback from the farms. From reviewing the set-up, increasing the number of farms attending the half-day workshop but still keeping each of the talks from the experts to a small group of less than 10 farms per session would allow for a reduction in cost. By running the sessions concurrently throughout the day we would then gain more value from the Experts as they would be speaking for the entire time rather than just for their allotted slot. The potential downside of this change would be that the farms would miss out on the input from the other Experts during the other talks which often occurred during the discussions. Running the workshop again in the alternative format and comparing the feedback results would allow us to evaluate whether this would be detrimental.

8. Conclusions

In summary, this proof of concept has demonstrated that all three of the Tech Check Approaches (Traditional, Digital Enabled and Full Digital) changed participants' awareness of, interest in, and ability to decide whether to adopt new farm technology. Based on the quantitative analysis described earlier in this report, we have found that all of the Approaches successfully increased the Immediate Outcomes measures (Table 9), and showed a positive results for the Intermediate Impacts (Table 10). The tables below are a summary of the graphs within Section 6 and the largest change for each row is highlighted in green.

Table 9 – Summary of the Farms' Average Change Before and After the Intervention (Final Survey Sample)

BEIS Stage of Adoption	Traditional	Digital Enabled	Full Digital
1. Knowledge & Awareness	+12%	+10%	+21%
2. Persuasion	+3%	+8%	+2%
3. Decision	+7%	+26%	+30%
4. Implementation ³	+17%	+21%	+13%
5. Confirmation	Not measured	Not measured	Not measured
6. Openness	Not measured	Not measured	Not measured

Table 10 - Intermediate Impacts Summary

Intermediate Impacts	Traditional	Digital Enabled	Full Digital
Tech Check changed the view of the farm about adopting new farm technology either 'Somewhat' or 'A lot'	70%	90%	59%
Farm intends to implement some, most or all of their Audit Report recommendations	62%	70%	45%
Change in level of adoption ⁴	21%	22%	19%
Overall Average change in adoption level percentage across the Technology Areas	17%	21%	13%

The Proof of Concept set out to design and deliver the Technology Audit and investigate two main hypotheses:

- A service can be developed which has valuable impact on farms by increasing their adoption of technology and therefore business productivity.
- This service can be economically viable by returning appropriate value to the farm and to the service provider.

³ Change in overall adoption regardless of the level of use.

⁴ Overall proportion of participants that increased or decreased the adoption level.

The sections below summarise the success of the Technology Audit and the outcome each of the Approaches had in relation to these hypotheses.

Technology Audit and Report

The Technology Audit was able to successfully assess the technology use of the participants across the 7 areas. Overall the Smart Survey software enabled us to use skip logic to ask targeted questions based on the participants' use of the technology and with minor changes the Audit could be delivered in a commercial setting. Feedback from the farms show that the areas covered were appropriate and relevant. Within Appendix 7 – Technology Audit Results, the aggregated analysis has been able to add to the industry's body of knowledge regarding the current level of technology use of Arable farms.

The personal Technology Audit Report successfully gave participants a clear, targeted list of recommendations which they could implement for their business. The majority of farms across all three of the Approaches said they were likely to implement 'some, most or all' of their recommendations and overall Figure 19 in Section 6.3 showed that only a small percentage of farms felt the recommendations were not relevant.

Traditional Approach

The Traditional Approach was the least successful of the three approaches in increasing participants' adoption level. Nevertheless, this was still a net positive impact on participants, with good feedback received. Although, a majority of the participants chose a different Approach when asked which of the three Approaches offers the most value. Economically, the cost to serve was much greater than the participants' stated willingness to pay. While we see some ways of achieving a marginal reduction in this cost to serve, significant cost reduction would not be viable while maintaining sufficient value to participants. Overall the PoC showed that this Approach is the least viable option.

Full Digital Approach

The Full Digital Approach had the lowest completion rate with only 46% of participants completing the intervention and of those participants only 55% of them logged into their online platform to watch the Technology Expert videos. While the Approach had the greatest immediate impact on participant understanding, it scored lowest on Intermediate Impacts. We therefore conclude it is less effective than other Approaches for overall participant impact. It is, however, the most cost effective Approach, especially now that the majority of the fixed costs of developing expert video resources have occurred, although some of the videos would likely need to be remade. Nevertheless, we do not believe this Approach can adequately meet the value and impact required for participants to be viable: evidenced in that only 48% of participants completed the Audit and follow up surveys.

Over the long term, this Approach still holds merit, relying on much greater comfort from the target audience in engaging with 'self-serve' tools. It also presents a viable delivery mechanism under current Covid-19 restrictions. Therefore while we do not see this overall Approach as viable, elements should be considered in any future implementation.

Digital Enabled Approach

The Digital Enabled Approach demonstrated the greatest value to participants, reflected in its highest Intermediate Impact measures, and high levels of feedback on the sessions. However, this Approach is not economically viable in its current format, with a delivery cost over 5x the stated willingness to pay. Nevertheless, we believe that there exist sufficient ways to dramatically reduce the cost to serve and make this service economically viable, while maintaining its high value.

As such we conclude from the quantitative analysis that out of the three Approaches that were trialled as part of this Proof of Concept, the Digital Enabled Approach holds the highest potential as an economically viable way of having the greatest impact on farm technology adoption.

9. Recommendations

The recommendation of this report is that Yagro should progress from a Proof of Concept to a full scale trial. A full scale trial would seek to test the second hypothesis further to see if the Digital Enabled Approach can be offered as an economically viable service.

A full scale trial could incorporate:

1. Changing the Digital Enabled workshop design.
 - Test to see if running concurrent Expert sessions impacts the technology adoption of participants.
 - Include a control group to increase the quality of the research to Level 3 of the Maryland Scientific Scale.
 - Seek to find an economically viable design that maintains technology adoption but falls within the cost boundary of £100 - £250.
2. Incorporate Further Support feedback.
 - Clear independent data showing a Return on Investment was listed as a need across all of the technology areas, further research could be done to see if independent data exists and can be presented to the farms attending the workshop.
3. Increase the number of workshops offered.
 - The farms that attended the Cambridge and Cirencester workshops were based within a 1 hour drive of the venue, future workshops should therefore be offered in other areas of the country to make them accessible to the local farms and to see if there are changes in technology use between the areas.
4. Including a 'Future/Upcoming Technology' session in the workshop.

- Add another Expert session focusing on one or more of the suggested areas of farm technologies we received from the feedback in the Final Survey.
5. Improving the Pre, Post and Final survey designs to better capture the Outcome measures in order to improve the quality of the research.
- Specifically look to measure the impact the conversations the farms have with each other influences their adoption of the recommendations.
 - Incorporate more quantitative questions to decrease the potential for subjective analysis.

Appendix 1 – Technology Audit Questions (Separate Document)

Appendix 2 – Example Technology Audit Report (Separate Document)

Appendix 3 – Pre Intervention Survey (Separate Document)

Appendix 4 – Post Intervention Survey (Separate Document)

Appendix 5 – Final Survey (Separate Document)

Appendix 6 – Example Full Digital Technology Audit Report (Separate Document)

Appendix 7 – Technology Audit Results (Separate Document)

For more information and access to the Appendices please contact Yagro Ltd directly via info@yagro.co.uk.