Review of research and innovation that will impact the English agricultural and horticultural workforce

Executive summary

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1. Introduction

The nation's farms and farm workers need to adopt new technologies to compete effectively in the global marketplace. This study has looked forward at the innovation horizon in agriculture and horticulture and investigated how the skills base and training provision in the UK is addressing the changing needs of farming into the future. Previous work by Nye et al., (2023) showed that there currently exist both labour and skills shortages in the sector, a situation exacerbated by low training attainments. The current study shows that innovation, across the whole of agriculture, especially in digitalisation is already changing farm businesses, and it is anticipated that the pace of change will accelerate. This is likely to widen the training and skills gaps. We review how the provision of training is adapting, and how it needs to adapt further to support this important sector of the economy and our national food security.

2. Methods

Interviews were conducted with representatives of a cross-section of agricultural and horticultural research and innovation providers following a set format. Analysis of the transcripts identified the main areas of pre-farm gate innovation and these findings formed the basis of a second set of interviews with training providers and labour organisations. The synthesis of these inputs was presented to focus groups. A summary of all the findings was presented at an online workshop with a set of independent interested parties. After feedback on the findings, a structured discussion was used to address outstanding questions and points.

3. Findings

3.1 Workforce numbers

After many years of a declining workforce, there are indications that jobs in agriculture and horticulture will increase in number. These jobs will be in higher skilled and specialist careers, especially specialist consultants and contractors. Automation designed to reduce repetitive and onerous jobs will reduce the need for low-skilled and seasonal workers.

3.2. Principal areas of innovation

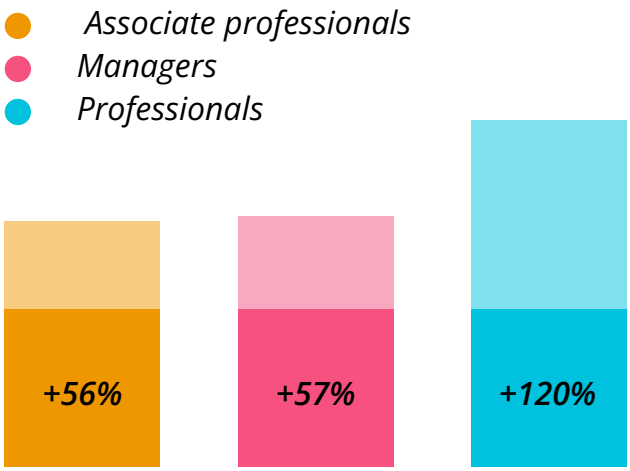
The principal drivers of change and innovation are the ever-increasing powers of computation and data analysis, and farmers have access to more data on their operations than ever before. In order to make best use of this tsunami of information, specialist services and new software capabilities will increasingly be needed for decision support. AI will be at the heart of many innovations, analysing complex systems and presenting solutions, integral yet hidden.

Precision agriculture will become increasingly autonomous, and robotics will replace routine, yet exacting handling operations.

The introduction of new biological solutions will be increasingly boosted by AI-driven decision support systems. In some farming systems, precision breeding may provide novel genetic diversity. In others, finding available beneficial genetic diversity will be guided by AI. As biological methods of pest and disease management become more necessary, IT support will increasingly help manage risks.

Prescriptive analytics will go beyond prediction to offer actionable recommendations based on real-time data to help match supply with demand and maximise efficiency. New roles will emerge, particularly for specialists who will manage and maintain these new technologies.

Expected growth in jobs requiring higher level skills



3.3 Adoption of innovation

There is a strong interest in innovative solutions to farming challenges, although adoption is held back by a lack of trust in new items (i.e. a preference for old, familiar technologies) coupled with challenging financial circumstances. In part, this approach to business risk can be associated with insufficient understanding of the new technologies.

The strongest driver of automation in all its guises is to improve efficiency, which often takes the form of ever more detailed monitoring to identify and isolate the weakest links. This feeds through to precision applications of farm inputs, improved genetic selections, and reduced waste of both effort and commodity. The immense volumes of data collected by sensors and other precision recording devices need advanced data handling skills and services.

AI and machine learning tools will hasten the rate of adoption by offering decision support, generally out of sight behind smart phone apps and IT service providers. On-farm decision making and specialist applications will be supported by increasing numbers of specialist contractors. Even with AI and specialist support, farmers and growers need to train for innovation because, ultimately, they are the decision makers and risk carriers.

The competitiveness of UK agriculture and horticulture depends on continued investment in innovation. Adoption of innovation requires the evaluation of business risks vs potential benefits and this evaluation affects confidence to invest. To help drive investment in modern, competitive farming technologies, understanding needs to be improved by encouraging training in higher level skills across the workforce.

3.4 Preparing for innovation

There are arguments stating that the bulk of training needed for innovative technologies will be provided by the companies selling new products into the market. Better products will have more intuitive interfaces, easier support functions and faster troubleshooting features. However, developers all echo the concern that users will benefit from improved data handling skills, in particular, with awareness of data security, the value of data, and the importance of data integrity etc.

Additional areas for which the sector will benefit from increased training are environmental and ecological sciences, and data analytics.

A large part of the future success of agricultural and horticultural businesses will be associated with how attractive the sector is for drawing new employees with non-traditional farm skills into farming. There is much pride in the farming community and this needs to be harnessed more to promote professionalism and engage in skills training to support new ways of working. This will be a welcome boost to rural job markets and local communities.

3.5. Directions for training:

The study found a strong agreement across innovators that the basis of making the best agricultural or horticultural decisions on farms of all kinds was a solid foundation in agricultural science coupled with a thorough understanding of the farm's immediate circumstances.

Nevertheless, with new technologies come new areas of learning. A range of new competencies will be required to install, operate, repair and maintain new equipment and manage new practices. This will be a new sector of highly skilled jobs, in many cases appended to current peri-farm gate occupations, such as in agricultural engineering, agronomy, IT, animal welfare etc.

Across all areas of innovation there was recognition of the need for new training in data handling skills. All trainees will need to be aware of data standards and contractual commitments and not expect only to feed Apps.

As many of the skills needed are at the interface between technology and farming, consideration is needed of how best to develop communities of practice, networks and mentoring because communication and team working skills will be important.

3.6 Challenges for training organisations:

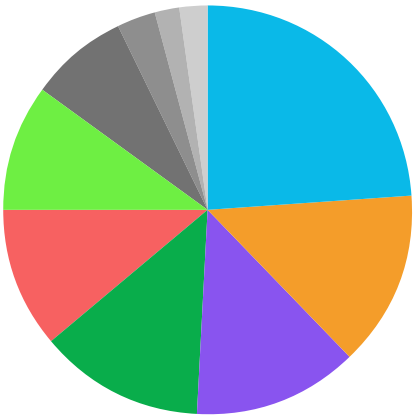
The formal curriculums of apprenticeships and T-levels are relatively slow and challenging to change. Other FE and HE provision is more dynamic. These learning opportunities provide funding which helps support the courses, but in-career skills training costs are often not supported and is considered expensive. CPD has low take-up, making it less attractive for providers.

It is anticipated that skilled people will be recruited from other sectors, although there are similar specialist skill shortages in all sectors. The attractiveness of moving into agriculture needs improvement. Provision of fast-track training in agriculture and horticulture will help transitioners adjust to their new environment. These new recruits are necessary additions to help with the rapid transition to higher-skilled jobs in the sector.

There is a critical need for better career support structures. Skills updating needs a combination of formal and non-formal training opportunities. At all levels, in all types of farming, greater access to training will benefit the sector.

The rate of pace of technology development, especially the adoption of AI and associated capabilities is outflanking the available skill-sets of the workforce. This presents an unprecedented challenge to training providers. The funding support systems for training in all its guises needs review.

New technologies currently being developed/recently implemented



- *24% Autonomous robots / automated equipment*
- *14% Carbon trapping and trading / other green tech*
- *13% Remote sensing / monitoring systems*
- *13% Big data and analytics*
- *11% Biological control pests and diseases*
- *10% Breeding and livestock*
- *8% Precision farming*
- *3% Artificial intelligence (AI) including machine learning*
- *2% E-commerce which involves website sales of goods and services*
- *2% Horizontal and vertical system integration*

4. Recommendations

- Innovation in agricultural capability needs to be matched by innovation in knowledge exchange and skills training ecosystems. It is imperative that the provision of training in data handling (in particular) is developed for trainees at all stages in their careers.
- All skills training for learners in the sector needs to be based in agriculture or horticulture (i.e. drawing on agricultural examples, and not generic material).
- Adaptation of the skills and knowledge exchange ecosystems for agriculture and horticulture needs to be rapid.
- New systems of learning, including training communities, cluster, mentoring groups, both in-person and online need developing.
- Funding for knowledge exchange and skills training in agriculture and horticulture should be available equitably across the country.
- Innovators need encouragement to join with training providers to develop up-to-date and engaging skills learning packages and access to innovative technologies. Consideration needs to be given to how the contractual terms of government-funded projects, such as those supported by Innovate UK and Defra, can include requirements for knowledge and skills training.
- The agri-food sector as a whole needs to be considered as part of the knowledge and training ecosystem so that, for example the retail supply chain can be part of the encouragement to upskill.
- Encouragement to change. Effective training in agriculture and horticulture needs a systems approach – a cultural change towards upskilling. A wider support package should be developed, not just for specific skill development but to include professionalism, peer support, and leadership in farming.

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