SCIENCE FOR ENVIRONMENT POLICY

The ongoing digitalisation of agriculture: identifying key research areas

The adoption of digital technology in agriculture is a rapidly advancing field. Further research is needed to inform investment decisions and policy formulation that ensure associated economic, social and sustainability benefits are achieved. This study consulted a range of stakeholders to produce a structured list of research priorities.

The arrival of technology-intensive, data-supported forms of precision agriculture has provided farmers with the potential to transform traditional methods of growing crops and raising livestock. Precision agriculture encompasses a range of technologies such as GPS yield and soil monitors, remote sensing, dairy robotics and software packages. Large-scale data systems and precision technologies are increasingly promoted as a potential means of improving food-production efficiency and driving progress towards sustainable agricultural solutions (such as use of passive biomonitoring sensors and handling of data to support certification schemes and policy refinement). However, optimal approaches and likely outcomes for the development of these new technologies are not fully understood.

Although there is a significant body of research on the subject1, more information is needed to support policy decisions, say the researchers. This UK study aimed to produce a collaborative and widely-applicable set of research priorities to guide and streamline further investigations in order to optimise the relevance and utility of future results.

The study involves a prioritisation exercise based on a three-stage consultation. The participants came from agricultural or commercial stakeholder groups and researchers of agriculture and technology. An initial list of 148 potential participants was drawn up, derived from personal contacts, online searches, recommendations from participants and social media outreach.

In stage one the researchers invited participants to suggest up to ten questions on key issues – relating to the use of digital information in farm-management to increase productivity and sustainability – which they felt could benefit from further research over the next 3–5 years. The 40 participants who responded produced 195 usable questions, which were assessed in depth by three researchers and grouped into seven themes (see below).

Environment

SCIENCE FOR ENVIRONMENT POLICY

The ongoing digitalisation of agriculture: identifying key research areas (continued)

In stage two, participants used an online survey to rank and prioritise the questions within each theme.

In stage three, 25 participants joined an online workshop to refine the submitted questions and produce a shorter, prioritised list of core questions under each theme, forming the primary output of the research.

The researchers present the resulting key themes as:

1. **Data governance:** involving issues relating to ownership, sharing and private-sector control of data. Participants' highly ranked questions under this theme were: ethical issues raised by data sharing and how to secure the confidence of end users in data-governance systems.

2. **Data management:** closely linked to the previous theme and including issues such as data security, analysis and legal frameworks. The highest rated question within this theme was: how to standardise data to render it usable by multiple systems?

3. **Enabling use of data and technologies:** encompassing issues around how farmers analyse and utilise data. The highest ranked questions considered how to give farmers the skills to collect and analyse data and the benefits they might get from using digitalised processes – compared to traditional methods.

4. **Understanding benefits and uptake of data and technologies by farmers:** covering issues related to the adoption of new technologies and associated benefits. Highly rated questions focused on demonstrating the benefits of digitalisation (for farmers and wider society), supporting farmers in adopting it and understanding their expectations and day-to-day experiences in its implementation.

5. **Optimising data and technologies for agricultural performance:** looking at how specific data and technologies can affect outcomes for farmers. Highly ranked questions included how data can be used to improve monitoring and practice in sustainability and the impacts of digitalisation on the day-to-day treatment of animals.

6. **Impacts of digital agriculture to the food system:** exploring impacts on work practices, employment supply chains and the public. The main questions focused on how digital data could democratise the food system and how these digital tools could enhance communication between farmers and the public.

Environment

SCIENCE FOR ENVIRONMENT POLICY

The ongoing digitalisation of agriculture: identifying key research areas (continued)

7. **New collaborative arrangements:** considering the involvement of farmers in development of new technologies and alternative working models. The main questions focused on how to represent farmers in agricultural digitalisation and how to promote collaboration in digital agricultural projects between varied stakeholders with competing goals.

As agricultural practice undergoes widespread change, focused research is important to reconcile challenges in maximising productivity, protecting the environment, reducing carbon emissions and supporting rural communities, say the researchers.

They acknowledge some limitations with the study, including the procedures used to select potential participants and the relatively large proportion of researchers relative to other stakeholders. However, they argue that this type of research-prioritisation exercise not only captures and structures the perspectives of a wide range of stakeholders, but also offers a valuable opportunity to reflect on the implicit assumptions of existing research approaches.

Further information

Following the publication in 2016 of A strategic approach to EU agricultural research & innovation, the EU issued a Declaration of cooperation in 2019 on A smart and sustainable digital future for European agriculture and rural areas which has been signed by 26 Member States.

For more information on this subject, see: EU 'The Digitisation of the European Agricultural Sector'. Available from: The Digitisation of the European Agricultural Sector | Shaping Europe's digital future (europa.eu) [Accessed 23 May 2022]; and EU 'Information Session on a Common European Agricultural Data Space'. Available from: Information Session on a Common European Agricultural Data Space | Shaping Europe's digital future (europa.eu) [Accessed 23 May 2022].

Environment