Policy Brief: Accelerating the Digital Transition in European Agriculture: Policy pathways to scale Digital Agricultural Technology Solutions (DATS)

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Policy Brief Title

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Highlights / Executive summary

Digital Agricultural Technology Solutions (DATS) are increasingly recognised as a key enabler for improving the competitiveness, sustainability, and resilience of European agriculture. However, despite their potential, the uptake of digital technologies across EU farming systems remains uneven due to structural barriers including limited access to finance, data governance concerns, interoperability issues, and skills gaps.

Evidence generated by the QuantiFarm project through real-life test cases demonstrates that DATS can significantly improve farm efficiency, resource management, animal welfare monitoring, and environmental performance. Yet adoption depends not only on technology availability but also on enabling favorable and long-term stable policy frameworks and viable business models.

This policy brief outlines key insights from QuantiFarm and proposes a set of policy recommendations to accelerate the uptake of DATS across Europe. The recommendations focus on improving data governance and interoperability, strengthening advisory and skills systems, enabling targeted financial instruments, and integrating digital solutions within the Common Agricultural Policy (CAP). Together, these measures can create a coherent policy environment that supports innovation while ensuring that farmers remain central actors in the digital transition.

Background & Challenges faced

Digitalisation has become a strategic priority for European agriculture, as reflected in EU policy debates on agricultural competitiveness, sustainability, and resilience. Digital technologies are increasingly seen as tools capable of improving productivity, optimising farm operations, supporting climate and environmental objectives, and strengthening the economic viability of farms.

However, the adoption of digital agricultural technologies remains uneven across sectors, regions, and farm types. Structural barriers continue to limit the diffusion of innovative solutions across European farming systems.

Several key challenges have been identified:

Data governance and interoperability gaps.
Farmers face uncertainty regarding the ownership, control, and use of data generated by digital tools. And while the data act is a necessary legal facilitator, the real support can come from a dedicated governance model, use case based, within an agricultural common data space. At the same time, fragmented platforms and proprietary standards limit interoperability between machines, software systems, and administrative platforms.

Limited access to finance and investment risk.

Many digital technologies require significant upfront investment, particularly robotics, automated livestock systems, and advanced precision farming tools. Small and medium-sized farms often lack access to suitable financing mechanisms or risk-sharing instruments.

Skills and advisory gaps.

Evidence from QuantiFarm shows that digital adoption is strongly influenced by the availability of digital skills, advisory support, and training opportunities rather than farm size or farmer age.

Market and organisational barriers.
Farmers often face challenges understanding pricing models, navigating service contracts, and assessing clear value from digital agricultural technologies. Solutions that better demonstrate tangible benefits and reliable support can accelerate adoption and utilization.Addressing these barriers requires a coherent policy approach that combines the necessary regulatory framework with financial support, market shaping measures, and capacity building across the agricultural knowledge and innovation system (AKIS).

QuantiFarm insights

The QuantiFarm project analysed the adoption and impact of Digital Agricultural Technology Solutions across multiple farming systems through real-life test cases and policy analysis.

The project combined two analytical approaches: a sustainability analysis, assessing environmental, social, and economic impacts of digital technologies, and a competitiveness analysis, evaluating policy frameworks and business models affecting digital adoption. Results show that digital technologies can deliver multiple benefits when integrated effectively into farm management. These include improved input optimisation, enhanced monitoring of animal health and welfare, better resource efficiency, and strengthened farm decision-making.

At the same time, QuantiFarm highlights several structural barriers affecting adoption:

1. Market failures and information gaps
Farmers often lack reliable information about the profitability and performance of digital solutions. Where such information is available, adoption rates are significantly higher.

2. Data governance and trust concerns
Farmers are reluctant to adopt digital tools when they do not retain control over the data generated on their farms. Clear governance frameworks and fair data-sharing rules are therefore essential for building trust.

3. Interoperability challenges
Lack of standardisation between digital platforms, machinery, and administrative systems increases costs and risks of vendor lock-in. Interoperability is therefore a key enabling condition for scalable digital adoption.

4. Skills and advisory capacity
Digital technologies require new knowledge and management practices. Training programmes, advisory services, and peer-to-peer learning networks play a crucial role in enabling farmers to integrate digital tools into their operations.

Overall, QuantiFarm concludes that successful digitalisation requires coherent policy mixes rather than isolated measures, combining regulatory clarity, financial incentives, innovation support, and capacity building.

Policy recommendations

Accelerating the adoption of Digital Agricultural Technology Solutions (DATS) in European agriculture requires a coherent policy mix that addresses regulatory, financial, and knowledge barriers simultaneously. Evidence generated through the QuantiFarm project shows that technology uptake is influenced not only by the availability of digital tools but also by the policy environment in which farmers operate. Creating enabling conditions therefore requires coordinated action at EU and Member State level, aimed at improving trust in digital systems, reducing investment risks, strengthening advisory support, and ensuring that digital innovation is fully integrated into agricultural policy frameworks.

A first priority concerns the development of clear and trusted **data governance frameworks for agriculture**. Farmers increasingly rely on connected machinery, digital platforms, sensors, and automated systems that generate large volumes of operational data. However, uncertainty surrounding data ownership, access rights, and the use of farm-generated data remains a significant barrier to adoption. Establishing and implementing transparent and farmer-centred governance rules is therefore essential to build trust and ensure fair participation in data value chains. At the same time, policymakers should continue to promote the development of interoperability standards across machinery, software platforms, and digital services to prevent technological lock-in and allow farmers to combine different digital solutions more easily. Initiatives such as the development of the European Agricultural Data Space can support secure and efficient data sharing for specific use cases with related services while ensuring farmers' control over their data. Digital agricultural technologies include not only data platforms and decision-support tools but also advanced precision machinery, robotics, automated livestock systems, and sensor-based equipment that enable the practical implementation of digital farming practices. Policies supporting digitalisation should therefore ensure that farmers can access and invest in modern agricultural machinery and equipment capable of applying inputs precisely and monitoring field and livestock conditions in real time.

A second priority involves **improving financial conditions for digital investment in agriculture**. Many digital technologies, particularly robotics, automated livestock systems, and precision farming equipment, require significant upfront investment that can discourage adoption, especially among small and medium-sized farms. Targeted financial instruments can play an important role in reducing these barriers. Policymakers should therefore consider expanding access to low-interest loans, guarantees, and micro-financing schemes specifically designed to support digital innovation in agriculture. In addition, fiscal measures such as tax incentives or accelerated depreciation for digital equipment could help reduce investment costs. Alternative financing arrangements such as leasing, machinery-as-a-service models, and cooperative investment schemes may further facilitate access to advanced digital and automated equipment for farms with limited capital, allowing broader uptake of innovation across diverse farm structures.

A third area for policy action concerns the **integration of digital technologies within the implementation of the Common Agricultural Policy (CAP)**. Digital tools can significantly support achieving key CAP objectives, including improved resource efficiency, enhanced environmental monitoring, and better farm management. CAP can complement other investments means. This could involve supporting digital solutions through rural development measures, promoting demonstration farms and pilot projects, and encouraging collective adoption through cooperatives and producer organisations. Such approaches can help reduce investment risks for individual farmers while accelerating the diffusion of innovation across the agricultural sector. Digital technologies and precision equipment can also support result-based policy approaches under the CAP, enabling farmers to measure and document outcomes such as nutrient use efficiency, PPP reduction, soil health indicators, and resource efficiency. Integrating digital tools into CAP monitoring and reporting systems can therefore reduce administrative burden while improving the accuracy of environmental performance assessments.

Strengthening **digital skills and advisory capacity** is another essential component of the digital transition. QuantiFarm evidence shows that the ability of farmers to adopt and effectively use digital tools depends heavily on the availability of training, advisory services, and knowledge exchange networks. Developing a coordinated European strategy for digital skills in agriculture could help ensure that farmers, advisors, and rural professionals are equipped to manage increasingly data-driven farming systems. Expanding vocational training programmes, short courses, and micro-credentials related to smart farming technologies would support continuous learning within the sector. At the same time, strengthening advisory services and peer-to-peer learning networks within the Agricultural Knowledge and Innovation System (AKIS) can help farmers translate technological potential into practical improvements in farm management.

Finally, policies should aim to **strengthen innovation ecosystems and digital entrepreneurship in agriculture**. The development of digital farming technologies often depends on close collaboration between research organisations, technology providers, and farmers. Supporting innovation-friendly regulatory environments can therefore accelerate the deployment of new solutions. For example, regulatory sandboxes could allow digital agricultural technologies to be tested under real farming conditions while ensuring compliance with safety and data protection requirements. In parallel, research and innovation programmes should continue supporting the development of advanced digital solutions such as artificial intelligence, robotics, and sensing technologies. Facilitating collaboration between research, manufacturing industry, and agricultural stakeholders will be crucial to ensure that innovations address real farming challenges and can be scaled effectively across diverse European farming systems.

Feasibility and impact potential

The proposed policy measures are feasible within existing EU frameworks and can build on ongoing initiatives related to digital governance, CAP implementation, and agricultural innovation.

Short-term actions such as improving financing mechanisms, strengthening advisory services, and promoting interoperability standards can deliver rapid progress in accelerating digital adoption.

Over the longer term, integrating digital technologies into CAP frameworks, establishing stable data governance systems, and developing digital skills ecosystems will create the structural conditions necessary for a competitive and sustainable digital agriculture sector.

Expected impacts include:

- improved farm productivity and competitiveness
- better environmental and climate performance through optimised resource use
- enhanced animal health and welfare monitoring
- stronger resilience of farming systems to market and climate risks
- increased innovation and entrepreneurship in the agri-tech sector.

Together, these measures can support a balanced digital transition that benefits farmers, consumers, and the wider agri-food system.

Further reading/references

AgricSpace / AgriDataSpace / CEADS-related and author surnames mean we sort by first significant word in each reference. Here is your list in alphabetical order:

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QuantiFarm Deliverable D5.4 – Policy Recommendations Assessing the impact of digital technology solutions in agriculture in real-life conditions.

Contact details

Giuseppe Sirignano – Policy Advisor in Research and Innovation – Copa-Cogeca - giuseppe.sirignano@copa-cogeca.eu

Vanja Bisevac – Research Director – CEMA: European Agricultural Machinery - vanja.bisevac@cema-agri.org