DESIRA POLICY BRIEF

Digital tools to help reduce agricultural inputs

This policy brief presents the results of interviews and workshops with stakeholders carried out in the Living Lab (LL) Agronov, in Bourgogne-Franche-Comté Region, France. The scenario question of this LL was "**What will be the contributions of digital technologies to accompany the reduction of inputs in agriculture by 2031?**" Within this context, two scenario narratives were elaborated. The "better not best" (BnB) scenario considers competitive and relevant digital solutions, good evolution in terms of training and digital literacy, advisory services, and data management, strong potential of robotics and implementation of digital technologies to reduce the use of agricultural inputs. The "worse not worst" (WnW) scenario considers fragmented and costly digital solutions, poor training and digital literacy, slow evolution of advisory services, failing data management, weak potential of robotics and implementation of digital technologies with less obvious impacts on the use of agricultural inputs. Five central policy recommendations are provided based upon the suggestions of the scenarios.

CONTEXT

The LL Agronov is an agricultural cluster dedicated to promoting agroecological transition. Bourgogne-Franche-Comté (BFC) is an agricultural region characterized by intensive large-scale cropping systems and livestock systems with many high-quality labelled products. The region includes two main territories (i.e. plains and mountains), and an important urban area (Dijon). Agronov is composed by 61 members and 80% of them are companies (including start-ups). The mission of Agronov is to pool skills within an ecosystem associating not only consular actors, professional agricultural organizations, but also research institutes and training organizations. It aims to understand the needs of actors in the field, in order to promote innovation through experimentation and transfer mechanisms within various sectors of agriculture in the BFC region.

Figure 1. The partner network of Agronov in the Region of Bourgogne-Franche-Comté
Source: website of Agronov

The objective is to determine how digital technology can contribute to the emergence of innovations in favour of agroecological transition in agriculture. It concerns the dissemination of digital tools to be used by agricultural stakeholders and local communities in favour of more sustainable agriculture for different types of products and in connection with the relocation of food production.

The analysis of the impacts of digitalisation leads us to three different topics: (1) digitalisation uses and their specificities according to the characteristics of farms (including digital culture, financial sustainability, types of products and location); (2) the obstacles to the adoption of digital technologies (weaknesses in interoperability, "white areas" without good internet connectivity in rural areas, low standardisation of digital tools and plethoric solutions offered); and (3) factors accelerating the digital transition to serve agroecological transition (generation renewal in farmers, and new forms of advisory support).

RESEARCH APPROACH

The scenario question discussed with stakeholders in the two workshops is as follows: "**What will be the contributions of digital technologies to accompany the reduction of inputs in agriculture by 2031?**"

The stakeholders involved included farmers, cooperatives, farmer unions, researchers, policy advisors, founders of agritech start-ups and farm advisors.

These workshops followed the STEEP-methodology where the discussion focused on the Social, Technological, Environmental, Economic and Political aspects connected to the impacts of digital technology.

AN OPEN AND PARTICIPATORY EXERCISE WAS CARRIED OUT WITH THE STAKEHOLDERS TO IDENTIFY THE DRIVERS OF CHANGE AND PLAUSIBLE FUTURE PATHWAYS

During the online scenario workshop held in January 2022, the elaboration of scenario narratives was carried out through defining drivers of change and identifying plausible future pathways.

First, the participants agreed upon the following finalised version of the scenario question: "**What will be the contributions of digital technologies to accompany the reduction of inputs in agriculture by 2031?**".

Accordingly, an open and participatory forecasting exercise was carried out to answer this question. The participants were able to identify the drivers of change and discuss the possible evolutions of those drivers.

Then, the LL team worked on two so-called intermediate scenarios ("better but not best scenario" and "worse but not worst scenario") characterised by different and plausible evolutions of socioeconomic, environmental, political and technological drivers. Two extreme scenarios (referring to "utopian" and "dystopian" situations) were also depicted.

SCENARIOS DEVELOPED

Because we used the STEEP methodology, discussions went much broader than just digital technology and touched on issues such as environmental policies and knowledge.

Domain	Drivers of change
Social	▪ Societal expectations for a more environmentally friendly agriculture ▪ Training ▪ Evolution of agricultural advisory services
Technological	▪ Data sharing / Interoperability/Sovereignty ▪ Robotics
Economic	▪ Economic valuation of agroecological labels ▪ Competitiveness and economic relevance of the proposed solutions
Environmental	▪ Extreme weather events ▪ Pressure on natural resources (water, soil, biodiversity)
Political	▪ Right to experiment on a certain number of practices ▪ Payments for Environmental Services (PES)

Figure 2. Drivers of change identified
Source: Scenario workshop with partners of Agronov

In the "better but not best" (BnB) scenario, digitalisation has improved the way agricultural inputs are used in France, and French agriculture has managed to reduce its pesticides use by at least 40%. A paradigm shift has been needed to move from curative crop protection to other means using no chemical pesticides to prevent the appearance or development of pests in the crops. Digital technologies have also helped to reduce the pressure on natural resources, though being adopted to varying degrees depending on the sector and the actors. Another game changer is that farmers are allowed to do experiments and improve their performances in a local and situational way in the search for levers to reduce inputs. Open innovation is seen everywhere and the boundaries between scientists and practitioners become blurred. Academic research and field solutions are better connected.

In the "worse but not worst" (WnW) scenario, digitalisation has helped French agriculture to reduce pesticides use by less than 20%. The lack of digital literacy remains a burden for French agriculture. Farmers are not given adequate training on the proper use of inputs, digital technologies, and data. Farm advisors only partially master digital tools and technologies, and fail to give proper advice. The payments for environment services (PSE) are insufficient to allow the sector to invest fully in digital solutions promoting environmental services from agriculture. Furthermore, robotics has shown limited potential (e.g. too costly and mainly focusing on the labour issue). Farmers do not have regulatory approval to conduct experiments. They can only rely on references and standards that are sometimes not adapted to their situation.

POLICY RELATED DISCUSSION

The discussion in the workshop around the drivers of change for the reduction of inputs in agriculture in France suggests the following three levels of local needs for digital policy-making:

First, the drivers such as societal expectations for a more environmentally friendly agriculture, increasing awareness of the pressures on natural resources, and unpredictable trends of climate change and especially extreme weather events, are the most important motivating factors nowadays for agroecological transition and reduction of inputs in agriculture. Digital technologies have great potentials to contribute to meeting social demands related to these issues. Public funding and other political resources linked to environment concerns can be mobilised for the development of digitalisation.

Second, as for the development of digitalisation itself, it concerns the improvement of digital technologies, especially robotics, training of farmers and agricultural advisors, secured data sharing and data interoperability, valuation and communication of the contributions of digitalisation, etc. These are all among the drivers selected by the participants, asking for public funding and other supports such as networks of partnerships, platforms, and expertise. Specifically, the participants of the workshop emphasised the right of farmers to do experiments, and claimed it as a critical factor for promoting open innovation adapted to local needs in the peculiar context of the BFC Region.

Finally, the participants think that the competitiveness and economic profitability of the digital solutions should also be considered. In order to make the contributions of digitalisation more visible, other than the traditional social and political ways, e.g. labelling, prize, etc., alternative ways of economic valuation should also be developed, for example, the economic valuation of agricultural labels on the markets and payments for environmental services (PES). Related legislation and policy-making are thus needed.

THE COMPETITIVENESS AND ECONOMIC PROFITABILITY OF THE DIGITAL SOLUTIONS SHOULD ALSO BE CONSIDERED.

POLICY-MAKING NEEDS TO SUPPORT ECONOMIC VALUATION OF THE CONTRIBUTIONS OF DIGITALISATION IN ORDER TO MAKE THEM MORE VISIBLE.

The key challenges for Agronov mainly include constraints to environmental performances, increasing extreme weather events, and the pressures from markets in terms of economic competitiveness. The risks linked to digitalisation include for example unequal access to digital technologies, data security problem, legislative constraints imposed on industrial agriculture using digital technology, etc. The opportunity is that the currently rapid development of digital technologies has great potentials in contributing to the growing requirement for an environmentally friendly agriculture. The differences between the scenarios are mainly in their level and capacity of digitalisation (from low to high) facing the challenges and risks, however, the designing of scenarios also concerns trade-offs between different targets.

UNREALISTIC TO EXPECT PERFECT SOLUTIONS ADDRESSING ALL THE CHALLENGES AND RISKS, THE DESIGNING OF SCENARIOS HAS TO CONSIDER TRADE-OFFS BETWEEN DIFFERENT TARGETS.

In the case of Agronov, the development of robotics, automated machines and other intelligent digital technology is needed in order to be able to predict extreme weather events or achieve environmental goals, however, it can be contradictive with the low level of digital training in farmers, social rejection against robotics and industrialised production for environmental concerns, economic competitiveness of the system because of high cost of robotics, and other aspects.

The BnB scenario suggests a policy option emphasising on the training of farmers and agricultural advisors, communicating with residents and consumers, and development of economic valuation and payments for environmental services to improve the visibility of the contributions of digitalisation. The second priority is the development and promotion of high-performance digital technology. A diversified adoption of digital tools in different types of farms is accepted. The WnW scenario suggests the results of a weaker version of this policy option.

POLICY OPTIONS

Encouraging the development and adoption of digital technology to reduce inputs use in agriculture

- Providing public funding to research and innovation on digital technologies to reduce inputs use in agriculture and pressures to natural resources (water, soil, biodiversity, etc.).
- Encouraging research and innovation on digital technologies to strengthen the capacity to predict climate change and extreme events
- Supporting farmers for the adoption of digital technology and to prevent potential risks.
- Promoting equal access to digital tools and technologies.

Training to farmers and agricultural advisors

- Promoting professional education preparing new farmers.
- Improving the attractiveness of working in the agricultural sector.
- Developing training programmes and communicating platforms for agricultural advisors.
- Developing appropriate training programmes for the older generation.
- Developing simplified or automated version of the digital technologies.

Valuation and communicating on the contributions of digitalisation

- Communicating with residents and consumers on the advantages of using digital technology.
- Improving the legislation and political supports to transfer the contributions of digitalisation into economic benefits to farmers, e.g. economic valuation of agricultural labels, Payments for Environmental Services, etc.
- Developing participative approaches involving different stakeholders to prevent the potential risk of digitalisation.

Encouraging bottom-up open innovation in agriculture

- Legislative permission for farmers to do experimentation on the use of digital tools.
- Establishing networks associating multiple stakeholders to facilitate the innovation of farmers and experience sharing with other stakeholders.

Promoting data sharing and security

- Facilitating data collecting and sharing between stakeholders and along the value chains.
- Creating an open data platform dedicated to the agriculture sector
- Establishing regulation on data use and security.
- Establishing a standard of data interoperability adapted to the agricultural sector.

This policy brief is published in the frame of the EU-funded DESIRA project and aims to provide recommendations for policy makers on how to support digitalisation in the context of reducing agricultural inputs to promote agroecological transition in France.

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