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INNOVATIONS IN FAVOR OF AGRO-ECOLOGICAL TRANSITION IN AGRICULTURE

André Torre, INRAE, France

Living Lab
Agronov
Key Digital Technologies
Insert short list of the technologies assessed in the SCPS
Keywords
Insert keywords of the report
More info: https://agronov.com/

Agronov is an agricultural cluster (LL) localized in the Burgundy Franche-Comté Region (BFC) in the East of France, characterized by great culture diversification (animal and vegetal) and two main parts (plains versus mountains), high quality with many labelling products and an important urban area (Dijon).

The activity of Agronov is dedicated to agro-ecological transition. Its focal question is: How does digital technology contribute to the emergence of innovations in favor of agro-ecological transition in agriculture?, declined into three sub-questions dedicated to data, new solutions and innovations.

The SCP system of Agronov shows that digital technologies are using for reinforcing agricultural transition (precision agricultural thanks to data collected by captors, robots…) and for responding at the same time to both legislation pressures and consumers' expectations. The use of digital technologies is not new due to the regulation pressures like CAP registration or precision farming but for another uses adoption is low and variable. The other factors influencing adoption, are in particular, both types of crops (plants / livestock) and of farms (small / large). The analysis underlines the needs for practical and simple tools, for concrete investment return for farmers and an economic inclusive data model (sharing, property and valorization of data more sustainable). Digitalization adoption is more related to human than technological brakes. So a collective strategy needs to be consolidated at regional level.

The analysis of the impacts of digitization leads to distinguish three topics: (1) uses and their specificities according to the characteristics of farms (including digital culture, financial farm sustainability…); (2) the obstacles to the adoption of digital technologies (weaknesses in interoperability, "white areas", …) and (3) factors accelerating the digital transition to serve agro-ecological transition.

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Context and main needs related to the Living Lab's focal question

Burgundy Franche-Comté is an agricultural region characterized by great culture diversification (animal versus vegetal), two main parts (plains versus mountains), high quality with many labeling products and an important urban area. Agro-ecological transition is the main driver for all supply chains.

The regional agricultural performances are rather good with five dominant technico-economic orientations: field crops, meat cattle, milk cattle, viticulture, polyculture livestock farms. A substantial part of production is very well known and benefits from geographical indications, particularly in viticulture and cheese production.

Strengths: commitment to the agro-ecological transition, quality of the regional agricultural and agri-food industry, dynamic early adopters, positive strategies of cooperatives and collective organizations, fall in price of certain equipment.

Weaknesses: weakness of data sharing, lack of digital culture and skills, transition to the industrial phase in progress, digital tools not always adapted to the reality on the ground.

Opportunities: concentration of farms and lack of labor, open data as an opportunity to boost exchanges and create new services, incentives towards the adoption of new practices, use of already existing techniques, opportunities to reduce the arduousness of agricultural professions.

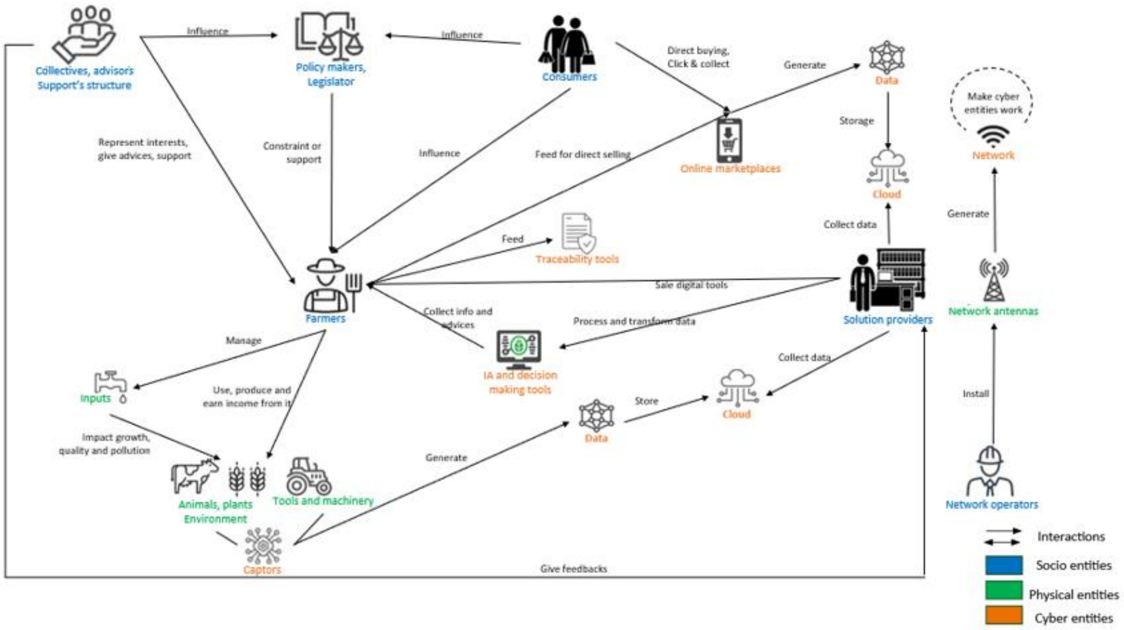
Threats: heterogeneity of players and strategies between various territories, need to secure sustainable solutions, lack of robust data economic models, lack of interoperability standards, energy-consuming digital technologies.

Main digitalization needs

- *Struggle against white areas which prevent the deployment of digital tools by lack of connectivity, with the deployment of fiber, 4 and 5 G, and satellites.*
- *Strengthen the interoperability of systems, develop a common language and data exchange standards allowing communication between digital objects.*
- *Secure solutions and promote interoperability of systems, in order to guaranteeing farmers a lifespan of connected objects allowing at least amortization of the investment.*
- *Need to find robust business models for data sharing, in order to guaranteeing a return on investment from data sharing and de-privatizing dataflows, and to move towards more collective actions*
- *Need to meet consumer expectations, particularly in terms of product durability and traceability, with the development of reliable traceability tools strengthening the link between producer and consumer.*

The Socio-Cyber-Physical (SCP) system

The diagram is a representation of the Agronov cluster translated into a system with three types of entities: social entities (blue), physical entities (green) and cyber entities (orange). Social entities correspond to types of actors and other elements (e.g. regulations). Physical entities are the tangible elements used by social entities in the course of their activities. Cyber activities refer to digital technologies. This representation materializes the interactions and how digital technologies impact them.



Interactions developed between each system entities (intra and inter-domain)

- *Socio- socio: Public policies and regulations impacts influence of consumer's needs, services to the farmers, cooperatives helping farmers in changes of practices, influence of farmers unions on policies.*
- *Cyber-cyber: sensors generating data in the cloud, internet and mobile networks allowing other cyber entities to operate, data used to feel the blockchains and online platforms.*
- *Physical-physical: Agricultural tools and machinery allowing cultivation of plants and breeding of animals, inputs which impact the growth of plants and animals + pollute the air and soil.*
- *Cyber-physical: Agricultural tools, machinery, plants and animals supports for sensors, probes, etc., Cell towers easing mobile network and the internet, smartphones, tablets and computers supports for platforms and marketplaces, DMTs, artificial intelligence, blockchain, etc.*
- *Socio-physical: farmers handling agricultural tools, growing plants and raising animals, providers selling agricultural tools, smartphones, etc., network operators installing cell towers.*
- *Socio-cyber: farmers feeding traceability tools + receiving information, suppliers providing sensors, collecting and processing data, consumers using platforms and marketplace and generating data.*

Impacts of digitalisation

What has been digitalised?		Main impacts (i.e. effects/consequences)	Sustainable Development Goals
• Agricultural, plant and animal production systems have been digitalized • Sensors, robots, software for precision farming, and broadband network (smartphones, Internet) are the most popular tools • AI, drones, and blockchain are less used	Direct	• Strengthening of dependence on solution providers and issues related to data ownership and consent to use	SDG XX: Name of SDG SDG XX: Name of SDG
	Direct	• Increase in pollution emitted by the use of digital technologies (CO_2 emissions, use of scarce resources, etc.)	
	Direct	• Reduction of environmental impacts and health risks associated with agricultural practices	
	Direct	• Contribution to the agro-ecological transition by improving knowledge and skills	
	Indirect	• Widening of the gap between the most dynamic farms that adopt digital technologies and those that remain in the background. Risk of negative impact on the number of farmers	
	Indirect	• Increase of the competitiveness and profitability of farms	
	Indirect	• Strengthening of transparency on the evolution of agricultural practices aimed at actors in the value chain, local authorities and consumers	
	Indirect	• Strengthening of the attractiveness of agricultural professions: reduced arduousness of tasks and technical skills	

Digitalisation generated impacts through the following mechanisms:

- **Design of digital technologies:** *Digital tools provide responses to the needs of the farmers, and improve agricultural practices for plant and animal production, towards greater sustainability. Materials used to manufacture tools, their functionalities and performance determine their price, so their adoption, and can increase the risk of exclusion. The way tools are interoperable or backwards compatible can increase their adoption, facilitate data collection and sharing, reduce user's workload and reinforce their trust.*
- **Access:** *Access to digitalization has made it possible to meet regulatory constraints in arable crops, in particular on phytosanitary products and water resources, and to increase farm size context. For breeders, digital technology provides solutions on the reliability of the information provided in order to facilitate the monitoring and management of animals.*
- **System complexity**: *The ease of tools is a determinant of their adoption, both by producers, actors of the supply chain and consumers: the more a system is complex, the higher are the skills to use it. Complexity of digital systems can create gaps between early adopters and opponents, creating exclusion processes. It can also increase their price, making the profitability of their adoption more uncertain.*

Main conclusions and recommendations

The main impacts generated by digitalization need to be analytically distinguish at farm, sector and territory levels.

- At the operating level (farm), digital technologies promote precision agriculture, facilitate the monitoring of the production, meet traceability requirements and offer a better information or a response for consumers (origin, quality…).
- At the sector level, they allow to identify the needs of the various actors of the value chain, to promote cooperation and the building of a strategy between them, and to share a common language between people and between tools.
- At regional and community levels (territory), they facilitate data sharing and promote support for farmers using them, help to build an inclusive model for the farmers primary producers of data, and promote the collection, processing and enhancement of data both within farms and at the level of the system as a whole through educational work, training of advisers and farmers.

Main recommendations are:

- to co-construct public policy measures to promote uses, to reduce individual equipment costs at the operating and collective levels (equipment, network connection, etc.), and to build new forms of help in supporting change and adoption (e.g. participating in securing the economic model of sharing and enhancing data;
- to promote interoperability by sharing a common language;
- to promote training and information for users in order to reduce the costs of equipment changes, data loss and to improve the return on investment of equipment (milking robots, sensors, etc.);
- to develop trusted third parties to share and enhance data in a system and for the benefit of an actor (e.g. GAFA, John Deer or Casioland for tractor equipment); to modify the regulations to legislate on the sharing of data;
- to work on projects at the regional level, with the goal to pool the different sectors, associate producers, digital players and consumers, to create value and share it in order to avoid capture for the benefit for a small number.

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