

Sustainable agriculture and food systems

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Like all activities on the planet, food systems face several challenges. They must feed a growing population while preserving natural and energy resources, combating global warming, and ensuring a decent income for those who produce this food, without limiting its accessibility for other consumers. Confronted with the various economic, social, health and environmental crises that have arisen since the end of the 20th century, the world of agriculture, food processing and distribution has to deal with social, environmental and economic challenges. All the players in the value chains of food systems are concerned: consumers, citizens, companies, farmers, associations and decision-makers. These developments are taking place in a context where, on a global scale, the question of food security, in the quantitative sense, is becoming increasingly important. At the same time, in developed countries, consumers are more and more demanding in terms of product quality, health safety, traceability and sustainability, but also in terms of price. Farms and agri-food businesses are actively seeking to improve their competitiveness and profitability with the least possible negative impact on the environment. Faced with these often contradictory, even antagonistic requirements, new behaviours and actions, as well as technological innovations, are emerging involving farmers, processing and distribution chains, public players and citizens. Food systems are thus attempting to transform themselves in the direction of greater sustainability (Saint-Ges et al., 2021).

In terms of the relationship between companies and local areas, environmental issues are renewing the question of local systems and their inclusion into the global dynamics of economic change. The concept of the industrial ecosystem highlights the potential synergies possible between industrial activities and environmental issues, on the condition as in clusters, that players coordinate based on geographical proximity, as well as organisational and institutional proximity (Torre, Zimmermann, 2015). In many parts of the world, the shortening of value chains and the regaining of control by local authorities over their food supplies is a potential response to improve the sustainability of systems while making them more resilient (Chiffolleau, Prevost, 2012; Lanciano et al., 2016; Prévost, 2014).

However here we are far from a coordination logic limited to companies alone, as the collective territorial project involves a wide range of stakeholders.

For example, implementing agroecological practices requires changes throughout the supply chain, including advice, logistics and marketing. Meanwhile, high consumer demand for local products is contributing to reorganise both distribution networks towards short circuits and local channels, and leading to changes in farmers' jobs, as they become retailers by creating platforms or shared sales outlets. The stakeholders involved in these alternative approaches and niche innovations seem to coexist with the conventional sectors, while hoping to contribute to the construction of a new, more sustainable food system model, in a context of transition and linkage between agriculture, food, health and the environment. New forms of players and organisations, such as SCICs and SCOPs for example, are often trying to implement these innovations, mainly at the local level. However, new technologies are being developed and accompanying these changes, and is helping to reconfigure both jobs and

relationships between players in food systems. This is particularly true of digital technology. Water constraints associated with climate change are driving the search for new varieties adapted to these new contexts. The circular economy aims to help reduce waste, while new solutions are constantly being explored to reduce greenhouse gas emissions.

While there is unanimous agreement on the need to change the model, changing practices and introducing new cropping systems and new forms of distribution are challenging existing production patterns in agri-food chains and coming up against obstacles. One obstacle to the adoption of innovative practices and the transformation of supply chains is the inadequate coordination of stakeholders (Galliano, Raynaud, 2015) and the lock-in of socio-technical systems (Magrini et al., 2013; Meynard et al., 2013; Picard, Tanguy, 2016).

These different examples, which can be found at all spatial and territorial levels, reveal, in line with studies in the economics and sociology of innovation, that all innovation, whether based on technological and/or organisational and/or social change, is an interactive, uncertain, cumulative and specific process. With this in mind, they invite researchers to develop multidisciplinary approaches (agronomy, genetics, technology, economics, sociology, management), taking into account the social and organisational as well as the technological dimensions of innovations. Ultimately, several questions remain about the future of agriculture and food: what technological and organisational innovations can foster the emergence and consolidation of innovative and sustainable sectors? What public action could encourage the development of these innovations and the emergence and structuring of new sectors? How can we renew the analytical frameworks associated with the development of new agricultural and agri-food practices and new distribution channels - processes sometimes referred to as industrial ecology and the circular economy?

This axis therefore proposes to develop thinking on the sustainability of agricultural and food (or agri-food) chains and on the forms of technological, organisational and social innovation that are currently emerging, through four themes:

1-From the perspective of analytical frameworks, a large number of studies have focused on these changes in the agricultural and food model and their transition, highlighting the positive impact of these alternatives (local supply chains, local short circuits, SYAM, etc.) from an environmental, economic and social point of view. However, **there is still a lack of indicators and analytical frameworks for evaluating the 'performance' in the broad sense of these new systems.** For example, we know that the logistic chains of local food supply chains are generally less optimised than conventional supply chains (CGAAER, 2021; Schmitt et al., 2017) and often require more energy per unit of food product than a conventional supply chain (ADEME, 2017; Loiseau et al., 2020). Geographical proximity is therefore not a sufficient condition. The coordination of the stakeholders and mode of governance at territorial level need to be questioned. What innovations are developing in these food systems? What are the brakes and levers on these innovations? How can the impact of these changes be measured, and at what territorial scale? What type of proximity is most important?

2-The role of technological innovation, particularly digitalisation: which technologies for which food systems? Numerous technological innovations are being promoted at all levels

in agriculture, food processing and, more generally, the food supply chain: digital farming, varieties adapted to new climatic conditions, blockchain for distribution, etc., is just a few examples. Does the development of these innovations improve the sustainability of food systems? For example, in what conditions does digital technology encourage farm intensification, or on the contrary, the implementation of agro-ecological practices? How can blockchains contribute to the sustainability of food systems? Other types of technology can also be analysed.

3-SSE organisations and their role in food system innovation: agricultural cooperatives or SCOPs and SCICs in addition to associations are organisations that are stakeholders in these changes. They can be the driving force behind the development of large-scale innovations, as can be the case, for example, with agricultural cooperatives, but they can also be the driving force behind innovation niches, particularly organisational ones, and alternatives to long, conventional agricultural and food supply chains. Research still poorly understands the contribution of these forms of organisation to the sustainability of food systems. Moreover, they may themselves constitute innovative forms of organisation.

4-The support of local authorities is essential in the development of producer groups and local product platforms, local supply chains, support for local and organic products in collective catering, etc. **The analysis of public levers and support for the renewal of the agricultural and food model deserves to be taken further.**

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