

# SUSTAINABLE FOOD SYSTEMS

## **CHANGE OF ROUTE**

## **IN THE MEDITERRANEAN**

EDITORS

**Sandro Dernini** and **Roberto Capone**



On the cover the work *Dream of the Soul* by ceramist Antonio Vestita  
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# TECHNOLOGICAL, SOCIAL AND ORGANISATIONAL INNOVATIONS AS KEY DRIVERS FOR SUSTAINABLE AGRIFOOD SYSTEMS

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**ABSTRACT** Agri-food systems are at the centre of the global debate on sustainable development. In the path towards more sustainable agri-food systems, technological innovation is a key factor. However, attention should also be given to social innovation. Good examples include a stronger cooperation between value chain actors, new market opportunities for sustainable farmers and more rigorous measurement, traceability systems and sustainability certification. Such social innovations are particularly useful in a context of smallholders and small food companies as in the case of the Mediterranean region, and are crucial for more sustainable production, which is at the core of the Mediterranean diet.

**Keywords** Sustainability - Social Innovation - Measurement systems - Agri-food Value Chain.

## **LES INNOVATIONS TECHNOLOGIQUES, SOCIALES ET ORGANISATIONNELLES COMME MOTEURS CLÉS POUR DES SYSTÈMES AGROALIMENTAIRES DURABLES**

**Résumé** Les systèmes agroalimentaires sont au cœur du débat mondial sur le développement durable. L'innovation technologique est un facteur clé dans le processus de mise en place de systèmes agroalimentaires plus durables. Toutefois, une attention particulière devrait également être accordée à l'innovation sociale. De bons exemples en sont une coopération plus forte entre les acteurs de la chaîne de valeur, de nouvelles opportunités de marché pour les agriculteurs durables et des mesures, des systèmes de traçabilité et des certifications de durabilité plus rigoureux. De telles innovations sociales trouvent toute leur utilité dans le contexte des petits exploitants et de petites entreprises alimentaires, comme c'est le cas dans la région méditerranéenne, et sont essentielles pour des productions plus durables, qui sont à la base du régime alimentaire méditerranéen.

**Mots-clés** Durabilité - Innovation sociale - Systèmes de mesure - Chaîne de valeur agroalimentaire.

## **1. INTRODUCTION**

Agri-food systems are at the centre of the global debate on sustainable development, for a variety of reasons, among which their impact on climate change and biodiversity, the importance that food security is assuming worldwide, the correlation of food with the use of natural resources, as well as the health of individuals and communities. As confirmed by the UN Food Systems Summit Stocktaking Moment event held in Rome in July 2023, food systems are fragile and urgent actions are needed, so as to avoid greater socio-economic disruptions and humanitarian crises.

Recent external factors such as geopolitical conflicts, high costs of energy, food and food related products have increased the tensions related to access, affordability and availability of healthy and nutritious food. Recognizably, the connection established for the COP28 between food and the implementation of the climate agreements shows the acknowledgement by the international community of the relevance of the sector.

In this framework, the Mediterranean region is a testbed for the world, as it mirrors the socio-economic and environmental complexities that we can register worldwide. The Mediterranean basin is a "climate change hot spot". Similarly, trends such as inequality within and among Countries, population growth, agricultural intensification, urbanisation and increasing of natural resource demand and consumption, impact negatively on rural communities and the fragile segments of the societies.

Technological innovation has been acknowledged as a powerful tool to address food security and promote sustainable food systems. This was highlighted also in the outcomes of the recent Stocktaking

Moment of the UN Food Systems Summit. In chapter 1 some key issues in the field of technological innovation are illustrated.

However, technological innovation is not enough. Attention should be given also to social innovation, that is, according to OECD “the design and implementation of new solutions that imply conceptual, process, product, or organisational change, which ultimately aim to improve the welfare and wellbeing of individuals and communities”.

For this reason, chapter 2 of the paper is focused on the need to innovate in terms of three key issues:

- **Cooperation among Value Chain actors**
- **New market opportunities for sustainable farmers**
- **More rigorous measurements, traceability systems and certifications of sustainability**

The positive interaction and cross-fertilization among these factors is also vital for the future of our communities.

## **2. TECHNOLOGICAL INNOVATION**

In recent decades, the global challenges related to food insecurity and the impact of climate change have become increasingly urgent. Promotion, adoption, effective use of technological innovation by small farmers, as well as the commercialization of knowledge and intellectual assets are critical elements to address such challenges.

Scientists and innovators have been called upon to develop impactful solutions, able to ensure a higher level of productivity and economic return for producers with lower exploitation of natural resources and an adequate amount of healthy and nutritious food for a growing number of population.

The ability to adopt innovation is a decisive factor to accelerate the transformation needed for more sustainable agrifood systems is critical also in terms of reduction of inequalities among countries and societies, while safeguarding natural resources and ecosystem and promoting the livelihood and an adequate economic return for farmers and producers. A critical gap to be addressed is the bottleneck that research and innovation encounter in developing research results into a marketable stage. Several obstacles still limit the knowledge sharing and full uptake by final beneficiaries of the innovations and research results offered by science and technological development. Services such as ad-hoc training and technology transfer are pivotal for enabling the different end-users to benefit from research results.

In this framework the experience of the Partnership for Research and Innovation in the Mediterranean Area (PRIMA) is illustrative, as it is engaged in continuing the support to more than 200 research and innovation projects through ad-hoc services, offered to the different investigators across the Mediterranean, in addition to the grants that each year the PRIMA Initiative ensures to the selected beneficiaries. PRIMA has in recent years promoted capacity building and knowledge sharing experiences in collaboration with dedicated institutions such as ICARDA and META, respectively on monitoring of project proposals' performance and on preparation of business plans. At the same time, PRIMA is also partnering with the Union for the Mediterranean in training activities for green skills related to the agrifood sector.

PRIMA has also initiated a collaboration with the International Center for Agricultural Studies of the Mediterranean-CIHEAM in order to deploy the innovations funded under PRIMA projects at larger scale, in specific territorial settings taking into consideration priorities and needs of the different stakeholders, engaging with a variety of local, national and international actors, both public and private ones. This

scale-up initiative, which has in Egypt the first pilot-experience, is meant to favour the uptake of innovations by farmers, communities and businesses. The upscaling initiative requires the ability to identify gaps opportunities, for which the identification of ad-hoc professionals such as the innovation brokers can be extremely useful.

In order to overcome inadequate technology-transfer mechanisms, specialised centres able to foster an entrepreneurial attitude and favour the transfer of research results to companies, SMEs and smallholders alike, are needed. The experience of the National Center for Agritech in Italy, strongly supported by public investment through the National Plan for Recovery and Resilience funded by Next Generation EU, is a concrete example in the direction of university-business collaboration in the key sector of agrifood. Agritech is illustrative also for its governance and structure, as it enhances the role of private sector, the cross-fertilization of ideas and the ability to offer multiple services such as an academy for specialised upskilling and reskilling, an accelerator to support start-ups and early stage innovations, a school for young researchers and talents, a pathway for innovation brokers and a technology transfer initiative with dedicated managers.

### **3. SOCIAL INNOVATION**

It is widely recognized in literature, by experts, professionals and managers that to ensure more efficient, sustainable, and resilient food systems, the effort of all its actors and stakeholders, at various stages of the agrifood value chain, such as farmers, processors, retailers, distributors, research institutions, policy makers and consumers is needed. Collaboration is therefore crucial for optimising resource allocation, improving efficiency and ensuring sustainability, food quality and safety and resilience. At the same time, it may face several challenges, including information asymmetry, market power imbalances, and resistance to change.

Given that the vast majority of food transactions occur in domestic (local and national) markets, territorial markets are a privileged entry point and lever to address food security and, more generally, the promotion of sustainable food systems. Also because smallholder farmers are responsible for most of the food consumed in the world, as well as most of the investments made in agriculture.

In territorial markets smallholders and farmers cooperate to offer their products (usually fresh) directly to consumers, thus activating a short-value chain that is able to bring together attention to fresh products, an active engagement and horizontal interactions between consumers and producers, a lower impact deriving from logistics and transportations (thought still present) on the ecosystems and other positive externalities, in terms of promotion of social relations and protection of cultural traditions.

More importantly, the territorial markets also have the potential of rewarding farmers as leading actors of the food systems, placing them at the centre of a variety of relations and empowering them towards different stakeholders. Such farmers' markets, whose Campagna Amica promoted by Coldiretti (a major Italian farmers' association) is a successful example, play an important role also in terms of dietary-pattern as they can positively balance the three dimensions of accessibility, availability and affordability that are considered as key factors determining individuals' food habits. The experience of territorial markets, especially farmers' markets, have multiple benefits for both producers and consumers.

Similarly, a powerful instrument to promote an integrated approach along the value-chain is public procurement. Interestingly, municipalities and public entities can favour a model that is respectful of



the quality of the product, the need for a fair economic return to producers, taking into account at the same time the constraints in terms of natural resources, and the requests by citizens and consumers. The experience of urban food policies, whose the Milano Pact is a leading example, in delivering accessible, affordable, safe and nutritious food to a greater number of people worldwide is growing attention worldwide, thanks also to the catalytic role played by FAO and other international actors on this issue. The role of farmers markets and of urban food policies, as multistakeholders experiences themselves, can truly cross-fertilize each other with positive effects on the food systems as a whole.

Public-private partnerships can also enhance collaboration within the agrifood value chain by aligning the interests of both sectors to achieve common goals. Effective collaboration is often supported by clear regulatory and policy frameworks that establish standards for food safety, quality, and fair trade. An example of multi-stakeholder collaboration, aimed to set up a policy framework on the responsibility of all the actors towards a food systems transformation, is the initiative launched by the European Commission within the Farm-to-Fork strategy, called “Code of Conduct on Sustainable Food Businesses and Marketing Practices]”. The Code consists of a set of commitments to be adopted by the agrifood companies and association representatives of the sector, to promote sustainability, enhance consumer trust, reduce greenwashing, improve transparency, reduce food fraud, support responsible sourcing, promote healthy diets, and foster innovation. Such a code helps promote ethical, responsible, and sustainable behaviour in the food industry. Overall, the Code benefits businesses by enhancing their reputation and consumer trust while promoting ethical and sustainable behaviours. It also benefits consumers by providing them with more information and choices to make environmentally and socially responsible purchasing decisions.

At the national level, the Italian agrifood system is characterised by intense relationships among farmers, industries, retailers and consumers, also through their associations, useful to promote sustainable agriculture, quality products, and culinary traditions. These associations play a multifaceted role in fostering innovation, protecting local traditions, and ensuring the global recognition of Italy’s agrifood heritage.

An example of successful collaboration among associations is “Uniti nel cibo”, a document produced by the “Working Group on food supply chains - Towards the 2021 Food Systems Summit”, activated at the Italian Minister of Foreign Affairs and International Cooperation. It represents a collective effort to be translated into business and supply chain practices able to reconcile the pursuit of the social and environmental sustainability objectives with economic development.

Furthermore, Living Labs as collaborative spaces where stakeholders come together to co-create, test, and implement innovative solutions in real-world agrifood contexts are also worth noting. They are emerging as innovative and dynamic platforms to bridge the gap between academia, industry, and farmers.

Agrifood Living Labs are also referred as user-centric places, ostering interdisciplinarity, real-world testing, improved by ongoing adaptation and improvement, encouraging knowledge exchange among a diverse set of stakeholders.

Based on these characteristics, Living Labs can be conducive to the rapid development, test and adoption of innovative technologies and eco-friendly practices, thus promoting sustainability, resilience, knowledge transfer, safety and quality of product. As an example, the Agrifood Living Lab, coordinated by the

Santa Chiara Lab of the University of Siena, is an innovative model, different from the city-centered (or municipality-centered) model, since it is coordinated by a research and innovation center with a strong capacity to link with many stakeholders of the agrifood sector thanks to the already existing international and national networks which it takes part of.

While Living Labs face some challenges, including funding, coordination, and scalability, they promise great expansion and evolution by being instrumental to address diverse agricultural contexts and challenges. Living Labs are also able to ensure active participation of marginalised communities, smallholder farmers, and underserved regions.

In Europe, many Living Labs are clustered in the European Network of Living Labs (ENoLL), a collaborative, pan-European organisation that plays a pivotal role in fostering innovation, research, and development in various domains through the concept of Living Labs. ENoLL was established in 2006 and has since grown into a dynamic network of organisations, institutions, and practitioners dedicated to open innovation, user-centred design, and the co-creation of solutions in real-world environments. Among its key features we could include the knowledge sharing, the support to research and innovation, as well as policy advocacy. While still facing critical challenges, such as data privacy and security, scalability and integration with other initiatives, ENoLL are critical to share best practices, test and validate innovative solutions, showcase successful cases and foster multistakeholder approach to address emerging challenges.

As stated at the beginning, the concept of sustainability is critical to face environmental, social, and economic challenges and its importance has never been more apparent given that it encompasses highly relevant topics, from gender equality to human rights to climate change.

To accomplish the successful transition from business as usual to a sustainable business, it is crucial to adopt practices of sustainability performance measurement, traceability, and certification. Measurement primarily concerns company's internal sustainability performance, traceability extends beyond company boundaries, directly involving the firm's supply chain, while certifications enable the strengthening and evaluation of product or process sustainability. Actually, in order to support the development of sustainable agri-food supply and value chains, it is necessary to adopt an integrated approach that takes into account various aspects concerning both internal company processes and its value chain.

#### **4. YOU CAN'T MANAGE WHAT YOU CAN'T MEASURE!**

In the ever-evolving landscape of modern business, measurement has emerged as a critical cornerstone for success. The current volatile, uncertain, and changeable operating environment in which firms operate is affecting the way companies measure their performance. Sustainability is no exception: sustainability performance measurement has become increasingly important for businesses and organisations across various sectors. It involves assessing an organisation's efforts and impacts related to environmental, social, governance and economic sustainability. Moreover, the evidence suggests that the use of sustainability performance measurement systems has the potential to broaden company's sustainability initiatives through processes that enable innovation, communication, and reporting.

The measurement of sustainability performance for agri-food businesses is not an easy task, especially for small and medium firms. There are many challenges to face, ranging from sustainability data collection and management and the wide variety of products to meeting Stakeholders' expectations and regulations.

Many agri-food businesses, especially smaller ones, may lack the expertise and knowledge to effectively measure and manage sustainability performance. Agri-food businesses are typically characterised by lack of financial and human resources, little attention given to the formalisation and to the evaluation of processes, and short-term strategic planning. The difficulties in measuring sustainability performance

The implementation of rigorous sustainability measurement processes provides several benefits to agri-food companies. Firstly, it can help build reputation and trust, and meet Stakeholders' expectations, who are showing deeper interest in how companies are addressing sustainability issues. Secondly, sustainability performance measurement supports and improves risk management practices, since it supports companies in facing uncertainty. Moreover, it attracts talents and plays a key role in translating management commitment into real actions, which is particularly relevant for sustainability. Setting up and monitoring measurable sustainability goals can drive product development and process improvement, leading to cost reduction through energy efficiency, reduced waste, and resource optimization. .

When measuring sustainability performance, organisations can use a combination of frameworks, tools, methodologies, and standards to assess their impacts and progress toward sustainability goals. The variety of tools available raises the level of complexity for small and medium agri-food businesses and allows companies to engage in cherry-picking, a practice to be avoided since sustainability requires a balanced and integrated measurement of its various dimensions.

In order to implement a successful and useful measurement system of sustainability performance, it is necessary to refer to a specific framework of analysis. Among the most widely used and well-known sustainability frameworks are: the Agenda 2030, which, with its 17 Sustainable Development Goals and its 169 targets, provides guidance on areas, themes, and sustainability targets to be measured; the International Integrated Reporting Framework, which identifies the aspects to be measured and reported in an Integrated Report; finally, the United Nations Global Compact, which through its Ten Principles identifies the topics and aspects to be monitored in order to keep under control the company's responsibilities towards People and Planet, and to achieve long-term sustainability success.

These frameworks are widely applied and debated. However, it is often difficult for small and medium agri-food business to adopt them since they require the implementation of large and complex measurement systems and they might not strictly consider the peculiarities of the agri-food sector. Agri-food firms should rely on frameworks that embed ESG topics in a balanced way and that are specifically adapted and targeted to them. The Four Pillar Framework (4PF) is built exactly according to this logic and represents a valid support for agri-food companies in order to implement a rigorous and comprehensive sustainability measurement system.

This framework is the result of intensive academic research, ongoing field discussions involving companies in the sector and it was elaborated within the "Fixing the Business of Food initiative" by Santa Chiara Lab at the University of Siena, the Sustainable Development Solutions Network (SDSN), and Columbia University (Sachs et al., 2020). It is a holistic and operational approach, adaptable to sector-specific characteristics and different company sizes, aimed at providing businesses with a tool for analyzing their corporate sustainability, identifying best practices, and evaluating their level of corporate sustainability. The 4PF is developed around 4 Areas and 21 Topics, which are reduced to 17 for agri-food companies. The four dimensions of analysis proposed for the latter are:

1. Products, services and strategies that contribute to the achievement of the SDGs (assessing the impact that companies have on human health through their products);
2. Sustainability of operations and internal processes (evaluating the economic, social, and environmental impacts of business activities);
3. Sustainability of the supply and value chain (evaluating the company’s role in promoting sustainable practices along its supply chain and value chain);
4. Good corporate citizenship (assessing the company’s commitment to managing its ethical and social impact internally and within the communities in which it operates).

The following Figure (Figure 1) lists the 21 Topics of the 4PF, divided by Area. Four themes have been removed from the framework for agri-food companies compared to the general framework, which include child labor, forced labor, freedom of association and collective bargaining, and resource rights. These themes are more typical of large enterprises and multinationals.

<b>Pillar 1</b> <b>Products and strategies contributing to healthy and sustainable diets</b>	<b>Pillar 2</b> <b>Sustainable Business Operations and Internal Processes</b>	<b>Pillar 3</b> <b>Sustainable Supply and Value Chains</b>	<b>Pillar 4</b> <b>Good Corporate Citizenship</b>
1. Product portfolios contributing to healthy and sustainable diets. 2. Food security 3. Marketing and labeling 4. Food safety and air quality	5. Child labor 6. Forced labor 7. Freedom of association and collective bargaining 8. Non-discrimination and equality 9. Occupational health and safety 10. Resource rights 11. Living wages and incomes 12. Sustainable agricultural production 13. Climate change 14. Biodiversity 15. Water use 16. Waste 17. Animal welfare		18. Governance and Management 19. Policymaking influence 20. Tax 21. Litigation

**Figure 1.** The Four Pillar Framework

The 4PF is aligned with the key international and European non-financial reporting standards, with a particular reference to the GRI, SASB, and the recently developed ESRS standards by EFRAG (European Financial Reporting Advisory Group).

Once a reference measurement framework has been identified, companies are called upon to choose which sustainability indicators and metrics to focus their attention on. Rigorous measurements and data collection provide agri-food businesses with valuable insights into their processes. They can use

these data to make informed decisions about product development, process improvement, and resource allocation, ultimately enhancing efficiency and profitability.

Nowadays, a large variety of International Sustainability Standards are available, and they encompass a range of guidelines, principles and indicators that address environmental, social, and economic sustainability on a global scale. The choice depends on various factors, including their level of experience in sustainability measurement, whether they are subject to non-financial reporting obligations, and the purpose of the measurement itself.

Among the internationally recognized standards commonly adopted today, the Global Reporting Initiative (GRI) takes the lead. It is an international nonprofit organisation that provides a flexible and modular framework defining principles and indicators to measure and communicate ESG performance. Specifically, the GRI Standards consist of three general standards (Universal Standard) applicable to all organisations and thirty-five specific standards (Topic Specific Standards). Recently, the ISSB (International Sustainability Standards Board), which belongs to the IFRS Foundation, has published two Standards, the IFRS S1 – general requirements – and the IFRS S2 – climate-related disclosure. The European Financial Reporting Advisory Group (EFRAG) has developed the European Sustainability Reporting Standards (ESRS) and released 12 “sector-agnostic” standard drafts (2 cross-cutting and 10 topic-specific Standards), which are applicable regardless of the industry the company belongs to. The ESRS give relevance to the measurement of sustainability performance along the value chain, the use of natural resources, biodiversity, and climate change.

Besides these general standards, agri-food businesses can measure their sustainability performance using sector specific standards. The Sustainability Accounting Standards Board (SASB) provides specific standards for the agricultural sector. The GRI has elaborated specific standards for Agriculture, Aquaculture and Fishing Sectors, which will come in effect for reporting from 1 January 2024. They provide information about possible material topics and the sector’s most significant impacts on the economy, environment, and people, including human rights. The ESRS as well will include specific sector standards, among which a set of indicators for the agriculture and farming sector.

Summing up, the lack of standardised sustainability metrics and reporting frameworks in the agri-food industry can make it difficult to compare and benchmark performance across businesses. Moreover, the variety of available measurement standards, as well as their ongoing evolution, makes the task of measuring and assessing sustainability performance complex and challenging to be implemented rigorously, despite being essential for tracking progress, setting goals, and reporting on sustainability initiatives within the agri-food industry’s value chain.

## **5. TRACEABILITY IN THE AGRI-FOOD SECTOR: A TOOL TO IMPROVE AND SPREAD SUSTAINABILITY ALONG THE SUPPLY CHAIN**

Traceability in the agri-food sector refers to the ability to track and trace the origin, production, processing, and distribution of food products through the entire supply chain. This includes knowing where raw materials and ingredients come from, how they are transformed into final products, and how those products reach consumers. It is a critical component of food safety, quality control, and ensuring compliance with regulatory standards. Efficient traceability systems often utilise technology, such as barcodes, RFID (Radio-Frequency Identification) tags, and blockchain, to create transparent and accountable supply chains, reducing the risk of fraud, counterfeiting, and foodborne illnesses.

Traceability of geographic origin is a specific form of traceability that focuses on recording and monitoring the geographic origin of a particular product throughout the production and distribution chain. This type of traceability is particularly relevant in the agri-food sector, where geographic origin can be an important factor in product quality, authenticity, and safety. Actually, it is often used to protect the reputation and quality of products associated with specific regions or to ensure compliance with regulations related to origin labelling, but also maintain consumer trust. For example, “DOP” (Protected Designation of Origin) and “IGP” (Protected Geographical Indication) are origin labels used in the European Union to indicate the geographic origin of agri-food products. These labels are an example of how geographic traceability can be used to promote and protect specific products based on their geographic origin.

Product or supply chain traceability refers to the ability to track and trace the entire lifecycle of a product or the components within a supply chain. This involves recording and monitoring the origin, production, processing, distribution, and any relevant information associated with the product or its components. In order to be implemented, it requires a rigorous and complex measurement system of sustainability performance along the supply chain, which can be supported by the blockchain, a specific type of distributed ledger technology. The latter offers the possibility to create document blocks. Each record is stored in a “block,” and these blocks are linked together in a chronological and immutable chain, promoting trust and accountability, since it is very difficult to alter or delete. Internet of Things (IoT) traceability systems can be used as well. They offer viable options for tracking the quality of food supply chains. Nonetheless, the majority of IoT solutions depend on the centralised server-client model, which poses challenges for consumers in accessing complete transaction data and tracing the origins of products.

Therefore, supply chain traceability is a tool that satisfies consumers and stakeholders’ increasingly demand for transparency in the supply chain and addresses sustainability issues like ethical sourcing, and fair labour practices. Among the Italian agri-food supply chain leaders, Barilla has affirmed its commitment to a sustainable supply chain for raw materials through the development and application of the Sustainable Agriculture Code (SAC) for the purchase of strategic raw materials. The projects implemented to apply the Code are managed by Barilla Sustainable Farming (BSF), which promotes more efficient cultivation systems aimed at obtaining safe and high-quality agricultural products, while also paying attention to environmental and social conditions and the economic well-being of farmers.. In order to implement systems aimed at monitoring traceability, rigorous and well-defined measurement processes must be in place. Rigorous measurements and traceability should therefore go hand in hand in helping agri-food businesses identify potential risks early, take appropriate actions to mitigate them and have better control over their supply chain. .

## **6. CERTIFICATIONS AND SUSTAINABILITY: THE NEED FOR INTEGRATION**

Certifications play a crucial role in the agri-food industry for several reasons. They can focus on products or on the organisational processes. They help agri-food firms ensure the quality and safety of products and they support the compliance with regulations, fostering the implementation of risk management practices. Moreover, they are a trust signal for consumers and, as a result, they can open up new markets and give access to a wider customer base. Certifications can help agri-food firms showcase their commitment to sustainability principles, as they may require tracking and documentation throughout the supply chain. This can lead to better supply chain management and traceability, again reinforcing the virtuous cycle among measurement, traceability, and certifications.

As for sustainability, nowadays agri-food companies can choose among a variety of certifications, which can also be sector specific, based on their products, target markets, and values. Some of the common types of certifications for agri-food companies include: ISO Certifications, which are international standards that cover different aspects, such as quality management (ISO 9001), food safety (ISO 22000), and environmental management (ISO 14001); Fair Trade Certification, which ensures that products are sourced and produced in a way that promotes fair wages and ethical treatment of workers; FSC Certification (Forest Stewardship Council), related to responsible forestry practices, often relevant for companies producing packaging or using wood products. Equalitas is an example of a certification that is sector specific: it concerns the wine sector and assesses its sustainability implementing an integrated approach that evaluates the company's social, environmental and economic approach. Other certifications, such as the B Corp, or Benefit Corporation involve the whole structure and management of the company.

The main critical points in the development and implementation of agri-food certified quality systems concern the efficiency in the data collection process, the quality and reliability of the data, and their costs. Moreover, data required by certifications are often not aligned with international non-financial standards, thus requiring agri-food firms to exert an additional effort in data collection and management.

The agri-food industry's success and sustainability needs a multifaceted approach that integrates rigorous measurements, traceability, and certifications. Therefore, it is necessary to proceed with the standardisation and simplification of measurement methodologies so that they can serve as an effective and tangible foundation for building efficient processes of traceability and certification. Sustainability measurement, traceability of geographical origin, and certifications need to be managed in an integrated manner as they are interdependent. To implement this integration, it is necessary to reinforce intangible value drivers, such as the cooperation among the value chain actors, the co-creation and the sharing of innovative practices.

## 7. CONCLUSIONS

This article has highlighted innovation as a key factor to promote more sustainable food systems, which are essential for our environment, the future of our societies and the adoption of healthy and sustainable diets. Technological innovation is certainly crucial. However, also social innovation is needed. For this reason, the experiences of living labs, farmers' market and urban policies are underscored, in a framework of cooperation among different actors in the value chain. Also the measurement of sustainability performances, certifications and traceability mechanisms are seen very useful for addressing the challenges of the fair ecological transition in the agrifood sector.

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