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Editorial

Consumption and Production Patterns for Agricultural Sustainable Development

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Agriculture has always played a key role in feeding the world population and ensuring the development of sustainable food production systems.

However, over recent decades, many farmers have over-exploited agricultural ecosystems in order to increase their production and incomes. This has caused a reduction or degradation of environmental sustainability, reducing farmers' profitability and leading many producers to abandon rural areas. Moreover, currently, over 820 million people in the world are hungry, while a third of the food produced is lost or wasted, with negative implications on economic, social and environmental conditions at a global level, highlighting how different production, educational campaigns and consumption approaches are needed [1,2].

In this context, the 2030 Agenda for Sustainable Development aims at eradicating poverty in all its forms and dimensions, by ensuring an economic, environmental and social sustainable development [3]. In particular, every country by 2030 should allocate public and private financial resources to develop and carry out relevant strategies and programs, by means of 17 sustainable development goals. One of them is represented by "ensuring sustainable consumption and production patterns" in agriculture that, in addition to feeding the world population, should ensure both the development of sustainable food production systems and promote responsible consumption by consumers. According to the Agenda, in fact, the sustainable cropping systems, on the one hand, have to increase productivity and production, but on the other, they should reduce the negative social and environmental impacts, thanks also to a sustainable changes in consumers' choices.

Therefore, the aim of this Special Issue has been to collect scientific studies worldwide dealing with the two main topics of the "ensuring sustainable consumption and production patterns" goal: (1) the adoption of sustainable production patterns in the agriculture sector; (2) the study of consumers' behavior towards sustainable food products. This Special Issue contains 13 papers that have tried to enrich the literature on agricultural sustainable development, taking into consideration at least one of its three dimensions: the environmental, social and economic dimensions.

Among the studies of the Special Issue, three studies have highlighted the importance of the introduction of product and/or process innovations in agricultural sustainable development. In particular, two papers aimed at evaluating land suitability, a key parameter for increasing production and planning a sustainable agricultural system.

The first one is a study conducted by Taghizadeh-Mehrjardi et al. [4] on rain-fed wheat and barley in the semi-arid regions of Iran by means of the FAO land suitability assessment framework. They have shown that a machine learning-based map approach is cheaper and faster than traditional approaches and, therefore, particularly apt for a data-poor region such as Iran, where there is a lack of soil information. Moreover, since the area under investigation is characterized by low suitability, the authors provide several land improvement operations in order to increase its production and that of other similar regions.

The second paper, instead, concerns the possible introduction of new soybean varieties into existing crop rotations in northern France [5]. In more detail, the authors, to assess

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the land suitability and provide an innovative approach, adopted spatially explicit pedo-climatic, agronomic and economic criteria. The results show that soybean could be a source of diversification in cereal-based rotations, reducing the risk of weed resistance and imposing a lower environmental impact but also providing greater profitability for farmers, especially in low cereal price conditions.

As regards the introduction of process innovations, another manuscript that readers can find in the Special Issue is a study conducted by Farina and colleagues [6]. The authors have analyzed the adoption of new edible coatings based on *Aloe vera* gel in combination with natural anti-browning and antioxidant additives for fresh-cut organic apples. The findings reveal that the adoption of these treatments maintains the post-harvest quality of apples during cold storage, by highlighting better chemical–physical parameters compared to untreated fruits but also the absence of detrimental effects on taste, aroma, or flavor thanks to a sensory analysis. In this matter, the authors affirm that these new natural treatments could allow the agri-food sector to extend the shelf life of organic fruits with sustainable processes which do not alter their sensorial characteristics.

Another way to improve the sustainability of farming systems can be represented by the introduction of ancient varieties or landraces, as shown by Varia et al. [7]. In more detail, the authors highlight how the landraces of durum wheat are able to valorize the marginal areas of southern Italy and especially organic agricultural systems thanks to their high resistance/tolerance to biotic and abiotic stress and the capacity to use limited resources. Moreover, the adoption of ancient varieties and landraces allows entrepreneurs to obtain higher incomes than with conventional ones, as consumers are increasingly willing to pay a premium price.

Over recent years, in fact, growing consumer interest towards organic, healthy and local products and short supply chains has been observed as, during their purchasing decisions, they attach increasing importance to the reduction of environmental impacts and transportation emissions but also to the socio-economic conditions of local economies. Therefore, in order to introduce more sustainable products or processes in agri-food chains, it appears necessary to understand the consumers' perception and behavior. Consumer knowledge, in fact, on the one hand, supports the agri-food companies towards the introduction of more sustainable products and, on the other hand, can help entrepreneurs to increase their competitiveness and income, by means of fully satisfying consumers' needs and interests.

In this context, a study conducted by Testa et al. [8] is aimed at analyzing the chemical–physical and sensory qualities, as well as the determinants, of Italian consumer preferences towards a local ecotype of loquat fruit compared to imported varieties. The results show that the cultivation of loquat ecotypes, together with effective marketing strategies, could increase the competitiveness and sustainability of certain Italian rural areas, where this crop has always played a significant role in the economy. This is due to the fact that local ecotypes have excellent physical–chemical and sensory attributes, and that consumers perceive them to be healthier and tastier than imported varieties, and they consider a short supply chain to be an important factor in purchasing local produce.

The importance of understanding consumers' behavior for more sustainable agricultural development is remarked upon by Fogarassy et al. [9], who have tried to better explain the relations between the circular economy and organic food purchasing behavior in Hungary. In particular, the authors have found a specific target to address more sustainable products, characterized by young people with a healthy lifestyle, as well as high income and educational level, who also buy organic foods thanks to digital information.

The study of consumers' behavior towards sustainable foods allows entrepreneurs and other stakeholders to modify or introduce new products and processes according to consumers' needs, by adopting effective marketing strategies. However, since innovations play a key role in the success and sustainable development of businesses, especially in a global market, it is also important to know about entrepreneurs' behavior. To this end, the study by Tóth et al. [10] is aimed at evaluating the attitude of Hungarian food business

leaders towards innovation, by analyzing the behavior of entrepreneurs. The results show that a positive attitude of entrepreneurs towards innovation, together with the intention to market new products, has a positive relationship with the performance of the innovation.

However, the ability and the attitude of a company towards introducing innovations also depends on the process of innovation diffusion that assumes a fundamental importance in agricultural sustainable development, especially in developing countries, as shown by Freeman and Qin [11]. In particular, their study among small farms in sub-Saharan Africa shows that farmers with higher levels of information access at the individual, social network and community levels are more likely to introduce in their small farms process innovations that can improve their competitiveness and income, thanks to higher yield and lower production costs.

This paper highlights that policymakers' decisions can have a very important role in maintaining and improving the economic and social sustainability of a certain rural area. Agriculture, in fact, is characterized by higher business uncertainties than other sectors due to the weather conditions that affect production and continuous imbalances between demand and supply, causing very significant price fluctuations. In the field of agriculture, therefore, the implementation of specific policies represents a valid tool to achieve the 2030 Agenda goals, favoring sustainable development.

In this regard, a very interesting study by Ouattara et al. [12] on rice farmers of Côte d'Ivoire has analyzed how the difficulty in accessing credit represents one of the main problems for introducing improved agricultural technologies. This causes low yield and high production costs, with a negative impact on economic and social sustainability in rice production areas where a policy aimed at reducing financial constraints could be promoted.

Another two papers, instead, take into consideration the importance that subsidies of rural development policy have in the agricultural sector in two EU countries to maintain economic and social sustainability in the long term. In more detail, the study of Klima et al. [13] shows that the actual subsidies for farms located in Polish mountainous areas are necessary to cover losses caused by lower yields of crops in these areas. The findings of Pavić et al. [14], instead, highlight that subsidies for younger Slovenian farmers have allowed the dairy sector to increase its competitiveness with numerous socio-economic benefits, such as generational turnover, restructuring of the supply chain and improved profitability.

Another interesting study, aimed at providing useful information to policymakers, was conducted by Heredia et al. [15], trying to evaluate the sustainability of small Indigenous farmers (Kichwa) in the western Amazon who use a traditional agroforestry system, called *chakra*. This empirical analysis provides useful information to maintain and improve the sustainability of this system which has been able to provide Indigenous people economic independence for thousands of years. The results show several strengths of chakra, such as energy and climate, water use, working conditions, biodiversity, land use and quality of life. Nevertheless, the authors note that this system can be improved in the use of materials and environmental protection, animal production, economic profitability and administration.

Finally, since agriculture depends more on the weather and the climate than many other sectors, the greatest challenge for its sustainable development in the coming years is represented by climate change. In this regard, Luh and Chang [16] have tried to estimate the effects of climate changes on Taiwanese crops. The results show that the impacts of seasonal temperature and precipitation variations differ according to the crop typology and localization of farms, significantly influencing the environmental, social and economic sustainability of rural areas.

Therefore, the original studies of this Special Issue have highlighted that sustainable agricultural development plays a key role in facing the challenges that will characterize the coming years, including the fight against hunger and poverty, the reduction of pollutants and climate change. Moreover, the achievement of more sustainable agriculture can no longer be delayed, especially during the COVID-19 pandemic that is destabilizing the global economy and sharpening the social and economic differences around the globe.

In particular, the papers show that there are several pathways to provide cropping systems sustainable agricultural development. Readers, in fact, can note that more sustainable development can be reached by the introduction of process and/or product innovations aimed at both reducing environmental impacts and increasing economic performances of agri-food firms. However, agricultural policies also play a key role in sustainable agricultural development, representing a determining factor for the long-term sustainability of several rural areas. Finally, in order to allow the agri-food sector to improve its competitiveness in the global markets, it appears to be fundamental to know consumers' behaviors and their purchasing choices.

All this information can help policymakers, farmers and agri-food entrepreneurs to deliver the goals of the 2030 Agenda.

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