

## PREFACE

When looking at the hierarchy of global issues, food production and consumption are among the most significant matters for many reasons.

Firstly, they form the biological basis of the existence of humankind, determining its physical survival. Diet has a huge impact on the health of society, and thus on its many consequences, such as the cost of maintaining the health care system and the cost of social security, to name but a few. The importance of food security and good nutrition for people is so great that its absence can contribute to social and political tensions of enormous magnitude, resulting in such phenomena as wars and migrations.

Secondly, food production and distribution form huge sectors with very numerous and diverse actors. Some of them are characterised by a very high degree of concentration of capital, which can give rise to the risk of oligopolisation of markets on a global scale, with all the negative consequences that this entails in terms of their great economic potential. These include the practice of offering food that is not conducive to health and the difficulty of controlling companies by state authorities, whose annual revenues exceed the annual GDP of many countries in the world.

Food production and consumption have a very strong impact on the degree of sustainability of the economy, both current and future. Food sustainability entails producing food in a manner that safeguards the environment, optimises the utilisation of natural resources, enables farmers to sustain themselves and improves the overall well-being of communities involved in food production, encompassing both people and animals. This concept serves as the impetus for a movement aimed at confronting the reality that our global food system consumes substantially more resources than it generates. According to FAO's report (2022), around 2.3 billion people in the world (29.3% of the global population) were moderately or severely food insecure in 2021: 350 million more compared to before the outbreak of the COVID-19 pandemic. Nearly 924 million people (11.7% of the global population) faced food insecurity at a drastic level, and this number also increased. With the projected global population reaching 10 billion by 2050, there is a necessity for

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a 60 to 70% increase in food production to cater to this additional demand. On the other hand, food production has a very serious impact on the environment. It is estimated that about one third of all greenhouse gas (GHG) emissions may be caused by the global food system. The largest contribution came from agriculture and land use change activities (71%), with the remaining being from supply chain activities: retail, transport, consumption, fuel production, waste management, industrial processes and packaging (Crippa et al., 2021).

Achieving global food security in a sustainable manner is one of the biggest challenges at the present time. It encourages research and popularisation of issues related to both the production and consumption of food in a sustainable way. On the one hand, the scientific topic is the development of technologies and processes that allow the production of food with minimal food losses and minimal negative environmental impact. On the other hand, scientists look for ways to strengthen positive attitudes of food consumers, i.e. shaping the diet in an environmentally friendly way and reducing food losses.

Making food production and consumption sustainable is a challenge that the authors of this monograph would also like to face. The book consists of two parts; the first one is devoted to the issue of food sustainability from the perspective of production, the second one—from the perspective of consumption.

The production perspective part (PART I) starts with a chapter devoted to sustainable food production and processing. The authors present here the main objectives of sustainable production and the European Union plan for sustainable agricultural production, highlighting such concepts as the One Health approach, Climate-Smart Agriculture, European Green Deal and the Farm to Fork Strategy. Additionally, the authors characterise methods applied in food production and processing, based on biological systems, including the use of microorganisms, since they may diminish the adverse environmental impact of modern food production. The authors of the second chapter focus on a broader perspective of sustainable farming, including both economic, environmental and social dimensions. The objective of this chapter is to assess the interaction between these dimensions of agricultural activity and to identify cause-and-effect relationships between them, using the example of family farms in Wielkopolska, i.e. one of the regions in Poland. The authors indicate the need to always consider agriculture as a broad and complex economic, social and environmental system, and to adjust the policies according to the region's peculiarities with its unique features. The third chapter brings a different perspective on food production, as it is devoted to digitalisation in the agri-food sector, which should be recognised as a set of modern solutions supporting and facilitating sustainability in food production. Industry 4.0 technologies are increasingly used in food production, leading to the development of Agri-Food 4.0. The use of the Internet of Things, artificial intelligence, big data and cloud computing enables advanced planning, control and optimisation

of food production both in agriculture and food processing. It positively affects the quality and safety of food and has a positive impact on the efficiency of the food chain process. The fourth chapter generally presents a modern approach to the packaging design that supports food sustainability. Concern for environmentally friendly packaging and packaging materials facilitates the development of its design in terms of recycling and increasing popularity of reusable packaging. Food sustainability is also one of the main prerequisites in the packaging optimum approach and ensuring product accessibility via its packaging applied in the supply chain. Active packaging systems allow producers to extend the shelf life of food, and intelligent packaging supports the reduction of food waste and losses. Modern solutions for automatic data collection, such as RFID tags and geolocation systems, can also support the management of data on food products in logistics. The fifth chapter highlights the circular economy perspective in food production and processing sectors. It summarises the life cycle-based tools that have potential for complimenting the implementation of circular economy in the food system. Based on that, the study identifies the current challenges as well as the benefits and potential of life cycle-based tools for providing a holistic approach that could strengthen available circular economy solutions. The last chapter within the first part contains a review of sustainable strategies presented in the literature for managing fruit processing by-products according to the circular economy principles. Sustainable management of fruit processing by-products is important to reduce the amount of food waste deposited in landfills and to develop strategies through their reuse for full valorisation and economic value added.

The second part of the monograph (PART II) is oriented on the consumers' perspective. The seventh chapter included in this part presents the concept of a 'sustainable healthy diet' in the context of international and national dietary guidelines, as well as the environmental impact of production and consumption of selected food groups and types of dietary patterns. The authors of the eighth chapter provide an overview of the assortment, market and consumption of various meat alternatives. Products replacing meat are made of various types of (mostly) plant-based raw materials including pulses/legumes, cereal proteins (mainly gluten), oilseeds, fungi (edible mushrooms) and algae; however, cultured meat and edible insects are also described. The ninth chapter is devoted to the food labelling system presented from the consumer's perspective. The aim of this chapter is to discuss the latest research showing how food labelling can support consumers in their healthy and sustainable purchasing decisions. It presents both front-of-pack (FOP) nutrition labelling and its influence on consumers' perception of product healthfulness and purchase intention, as well as date labelling and its consequences. The tenth chapter is dedicated to the sustainable food consumption manner. The authors report the results of a bibliometric literature review conducted to explore the current state of research on shaping sustainable food consumption attitudes.

The aim of the eleventh chapter is to identify the causes of food waste generated by households. To achieve their aim, the authors adopted a conceptual framework based on the assumption that household food waste originates in three predictable stages—shopping, storing and serving. The work presents the level and structure of food waste by food category, continents, and countries. Finally, the objective of the last chapter is to present solutions designed to redistribute surplus food as a food waste prevention tool. Surpluses of food are generated both in supply chains and in households. This chapter presents the structure of the surplus food redistribution system (SFRS) in terms of entities included in it. Three main types of SFRS institutions are presented here: food banks operating both as front-line and warehouse entities, social supermarkets and sharing systems, which work as initiatives based on some premises (physical places) where food may be left and taken from, as well as operating thanks to Internet platforms.

Our objective, as the editors and authors, is to disseminate widely the concept of food sustainability among both scientists and researchers, as well as among practitioners directly and indirectly related to food production and consumption. We truly hope that this monograph will help to make processes related to food more sustainable—at least a bit.

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