

# Preface

As we move into the future, decisions on food purchases will increasingly be influenced not only by price and quality, but also by social and environmental factors such as the sustainability of technologies used for food production and processing and their environmental and health impacts. Growing consumer awareness about the impact of processing and production practices on the environment, the high energy consumption of certain processes, health impacts of some of the technologies used in processing, and a heightened social and industrial consciousness to reduce the carbon-footprint are examples of factors influencing food choice. These factors have been made quite evident in the growing “buy-local,” “fair-trade,” “certified organic” trends. As a result, farmers and food manufacturers will increasingly be interested in identifying and using greener economically viable technologies for food production and processing. Some producers are already responding with the use of organic inputs in processing, use of recyclable and good-for-the-environment packaging, establishing just employer–employee relationships, and reducing animal testing in product development.

There is little doubt as we move into the future that nutrition will continue to be one of most fundamental needs of human beings. The food chain has evolved tremendously from a “do it yourself” mindset before the Industrial Revolution, to a fully developed industrial sector in which more than 90% of the current population do not know where their food comes from or how it is made. Since the Industrial Revolution, worldwide food production has increased significantly but at a slower rate than global population. As an example, in the year 2000, of a worldwide population of nearly 6.5 billion people, 70% were sufficiently fed, 15% were malnourished, and the remaining 15% were severely malnourished. At the same time most land and aquatic resources were overused.

The challenge as we move toward the year 2050 will be how to feed the projected nine billion global population who are likely to have a higher standard of living and are therefore likely to eat more, including eating more meat. To do this successfully will require that we produce 30% more food with much less impact on our environment.

Some of the most serious environmental concerns we face include, land use change and tremendous reduction of biodiversity ( $>10\times$  the sustainable rate), aquatic eutrophication by nitrogenous substances caused by over-fertilization ( $3.5\times$ ), global warming caused by enteric fermentation and use of fossil fuels ( $1.5\times$ ), aquatic eutrophication by phosphorus substances caused by fertilizer overuse ( $1.0\times$ ), water shortages owing to irrigation ( $0.7\times$ ), ecotoxicity and human effects of pesticides ( $0.5\times$ ), and so on.

But there is hope.

First, we are now aware of the problem. We now know that about 30–50% of food produced is wasted. Tools such as life cycle analysis (LCA) are currently being developed to provide a good global picture of the current situation and the main contributors to the present challenges. Initiatives are emerging from different parts of the world to identify more sustainable approaches to food production, transformation, and distribution. It is quite evident that one of the most important challenges of the next 40 years will be to find a balance between food supply and demand in a manner that is sustainable and that ensures the long-term survival of humankind.

*Green Technologies in Food Production and Processing* provides a comprehensive review of the current status of the agriculture and agri-food sectors in regard to environmental sustainability and material and energy stewardship and provides strategies that can be used by industries to enhance the use of environmentally friendly technologies for food production and processing.

In the first section, the book provides a global look at today's supplies, demands, and key players of the food supply chain. Key drivers of the evolution in the food supply chain are described based on past, present and future trends. Part II provides an in-depth description of food production and processing using the life cycle assessment (LCA) tool. Chapter 3 starts with a description of LCA as applied to the food sector followed by chapters describing in more details crop production, animal production, and food processing. Part III of the book provides information on approaches to use to improve food production practices (e.g., optimizing the management of nutrient cycles, analyzing benefits of organic farming, and quantifying transportation impacts, etc.). In Part IV, information on more sustainable food pro-

cessing approaches are provided, such as greener separation technologies (supercritical and subcritical fluid extraction, aqueous extraction), enzyme assisted food processing, electrotechnologies, greener technologies for microbial control, reduced energy unit operations and low environmental impact packaging. Part V further provides an in-depth look at some emerging analytical techniques for research and development that reduce solvent, chemical, and energy use. In the last section of the book, a critical analysis of some of the challenges associated with the use of agricultural resources to grow biofuels and bio-based products are addressed. In addition, technologies to reduce the generation of process-induced toxins are also reviewed. Furthermore, social factors that influence consumer perceptions about some of the current and emerging agri-food technologies, and the need and importance of biodiversity in maintaining sustainable diets of human populations are discussed in detail.

We wish to thank all the contributors to this book for the stellar job in compiling the most comprehensive information on *Green Technologies in Food Production and Processing* to date. We trust that this work will be a significant contribution to the agriculture and agri-food sectors and of use to policy makers, the food industry, and the general public.

Although much effort was made to avoid duplication of the information presented, as often happens with books of this nature, some minor duplication is unavoidable. We have endeavored to reduce this as much as possible. Additionally, we have made every effort to avoid errors. However, there is always a possibility that some oversight may have occurred. We take full responsibility for any errors and would kindly ask that we be informed of any such errors so corrections can be made in any future editions.

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