

Handbook of Sustainability for the Food Sciences



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To Mom and Gail

Preface

Many books on sustainability have emerged in the last decade, most of them written for agricultural systems, communities, and business in general. In contrast, this book presents the concept of sustainability adapted to the food supply chain with emphasis in food processing. This book is intended for food scientists, food engineers, and as instruction material for students.

The initial intention was to write this book focusing just on processing. However, isolating processing from the rest of the supply chain would provide an incomplete picture, and therefore, the book follows all steps from farm to fork with special emphasis on processing. The content of this book has been tailored for the food industry. However, most of the concepts are applicable to other industries, especially those similar to the food industry that do not produce toxic emissions.

With exception of what is harvested from seas, all primary food production takes place in agricultural fields. Because this is not a book on agronomy, several ideas about mitigation of the environmental impact when growing food are presented. The chapters on air emissions, water and wastewater, energy, and solid waste contain important information on how to minimize the environmental impact, reduce water and energy consumption, and mitigate environmental impact. However, these chapters are not exhaustive, and readers interested in the agronomic aspects of sustainability need to consult specific literature.

Long-term sustainability depends on four cornerstones: water, energy, materials, and the environment. The first three are declining commodities, which are essential to modern life and food production. As the population continues to grow, demand for resources will keep rising and the pressure on the environment increasing. The environment is often taken for granted, but the preservation of healthy ecosystems is essential because of the beneficial services that are gotten from nature. Because society values human life and humans are part of ecosystems, references are often made to direct and indirect impacts of industrial activities on human life and health.

The book is organized in four parts. The first part covers the basics of environmental sustainability and provides a detailed account of all the impacts of the food supply chain. The first chapter makes the case for getting serious about sustainability, and the second chapter condenses how the Earth and its ecosystems work. The third chapter summarizes the most important environmental consequences of food production, processing, distribution, and consumption.

The second part introduces tools to evaluate environmental impacts of products and services (Chapter 4), management principles to start working on sustainability (Chapters 5 and 6), and covers environmental claims and declarations (Chapter 7).

The third part contains a more detailed description of the environmental impacts and offers suggestions for alleviating these impacts. This part includes chapters on air emissions (Chapter 8), water and wastewater (Chapter 9), solid waste (Chapter 10), energy (Chapter 11), packaging (Chapter 12), and transportation (Chapter 13).

Part four is about what is needed in the near future to guarantee long-term sustainability of the food supply chain. Chapter 14 discusses the future conversion of biorenewables, and Chapter 15 summarizes the concepts presented in the book.

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Part I

General Concepts

1 Introduction to Sustainability

INTRODUCTION

In the 1990s the term *sustainability* emerged as a concept to reduce humans' environmental footprint and a way to assure the preservation of natural resources for future generations. The concept did not pick momentum steam until the last few years, when due to public scrutiny, many companies integrated the word *sustainability* into their corporate marketing strategies. Since then, many individuals have embraced the sustainability concept even without a complete understanding of the extent of its meaning. Others have been looking at sustainability as a new fad, which will soon fade. However, sustainability is here to stay.

By definition, sustainability is a simple concept, but it is difficult to implement. Sustainability is not just becoming more efficient in the use of energy and natural resources; it is a change in business practices. Likewise, total quality management (TQM) has changed the mind-set of many organizations by placing the customer first; sustainability is the challenge of minimizing humans' environmental impact and reducing dependence on nonrenewable resources.

TQM was the industry response to customers' demand for better products. Most companies adopted this program voluntarily to gain an edge over competitors. In the case of sustainability, pressure from declining resources will compel industries to implement real sustainability programs, thus making sustainability not just one more trend but instead, a concept that will need to be truly embedded in companies' core values for their long-term survival.

SUSTAINABILITY: A TERM TO STAY

Not long ago, a sustainable company was one that simply turned profits year after year (Simmons, 2008), and the term *sustainability* as it is known these days was a foreign word in most people's vocabulary. Today, sustainability and its associated jargon, including triple bottom line, social and environmental responsibility, green workplace, and such, have become part of everyday life of corporate managers, scientists, and engineers.

Conferences on sustainability and related subjects have sprouted around the world in nearly all technology fields. (See Sustainable Development Conferences Worldwide website <http://www.conferencealerts.com/sustain.htm> for a list of upcoming events.)