

Preface

The world's population is predicted to hit 9 billion by 2050, up from today's total of nearly 7.4 billion, and with it food demand is predicted to increase substantially. There are many factors that affect food production. The post-war "second agricultural revolution" in developed countries, and the "green revolution" in developing nations in the mid-1960s transformed agricultural practices and raised crop yields dramatically, but the effect is leveling off and will not meet projected demand. At the same time, many other factors are having severe impacts on food production: water stress and desertification are reducing the amount of arable land; many pests are becoming resistant to insecticides, but many of the most effective chemical agents are now banned under environmental regulations; underdeveloped infrastructure means that losses increase further during transport and storage; consumption patterns are changing and climate change is bringing new microbial diseases to food-growing regions along with more extreme and unpredictable weather patterns.

Global environmental change (GEC), including land degradation, loss of biodiversity, changes in hydrology, and climate change patterns resulting from enhanced anthropogenic emission of greenhouse gas emissions, will have serious consequences for food security, particularly for more vulnerable groups. Growing demands for food in turn affect the global environment because the food system is a source of greenhouse gas emissions and nutrient loading, and it dominates the human use of land and water. The speed, scale, and consequences of human-induced environmental change are beyond previous human experience, and thus science has a renewed responsibility to support policy formation with regard to food systems.

Estimates vary, but around 25 % of crops can be lost to pests and diseases, such as insects, fungi, and other plant pathogens. Climate change associated with agriculture is also a global issue. Agriculture is a significant contributor to greenhouse gases and is estimated to account for 10–12 % of total greenhouse gas (GHG) emissions. Some estimates are much higher when land-use changes, such as deforestation for farming, are taken into account: up to 30 % of 2004 human-induced GHG can be from agriculture and land use. Many of the issues highlighted are global problems. Meeting the world's food security challenge will require a multinational

collaborative effort to integrate the best research from science, engineering, and socioeconomics so that technological advances can bring benefits where they are most needed.

At present, environmental degradation and the consistently growing population are two main problems on the planet Earth. Fulfilling the needs of this growing population is quite difficult from the limited arable land available on the globe. Although there are legal, social, and political barriers to the utilization of biotechnology, advances in this field have substantially improved agriculture and human life to a great extent. Abiotic and biotic stresses greatly affect plant growth and development. When a plant is subjected to abiotic stress, a number of genes are turned on/off, resulting in increased levels of several metabolites and proteins, some of which may be responsible for conferring a certain degree of protection to these stresses. A variety of crops has been engineered for enhanced resistance to a multitude of stresses such as herbicides, insecticides, viruses, and a combination of biotic and abiotic stresses in different crops including rice, mustard, maize, potato, and tomato, among others.

The present volume covers some major global environmental issues that affect crop productivity throughout the globe, particularly in developing countries.

I wish to express my gratitude to all the contributors for readily accepting my invitation for not only sharing their knowledge, but for admirably integrating their proficiency in scattered information from diverse fields in composing the chapters and enduring editorial suggestions finally to produce this venture. I greatly appreciate their commitment. I would like to thank Professor Bijay Singh for writing the foreword and giving useful suggestions during the editing process.

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I hope this volume will be useful to all researchers as well as others concerned with agriculture and our environment.

Selangor, Malaysia

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