Preface

This book has been written to meet the specific needs of the applied aspects of Biodiversity with reference to environmental issues such as food security; biofuel production and dryland farming. These are now the frontier areas of research focus among researchers. The importance of biodiversity has tremendously increased in recent years. This book will fulfill the need for a one-volume scientific discussion on the major aspects of biodiversity in relation to food and nutritional security, biofuel production and dryland farming. This book is an attempt to furnish students and teachers the information at one place in consolidated and precise manner, covering tools and techniques involved figures, illustrations and examples along with research highlights with updated latest references, in order to elucidate topics making the subject more interesting and knowledge-rich. The book embodies eleven chapters and covers a wide range of topics like protection of phyto-diversity: conflicts and opportunities for biofuels harvests in India, land use policy is the key driver for biodiversity management, future habitat loss: greatest threat to the soil microbial biodiversity, digitalizing the biodiversity of India, etc. in the study of biodiversity and its management. Further, topics such as physiological and biotechnological dimensions for sustainable agriculture under changing environmental conditions, food security and nutritional safety: a challenge ahead, cultivation of traditional crops: an overlooked answers etc. have also been covered in the book. The book "Conservation of Biodiversity: Conflicts and Opportunities" is an attempt to provide concise yet comprehensive coverage of a true concept and application based knowledge to develop in-depth understanding of the subject.

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Prasann Kumar

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Introduction

India has a rich and varied heritage of biodiversity encompassing a wide spectrum of habitats. Energy source will play an important role in the future. Besides the crop plants which provide food and fibers, several thousands of wild plants having significant economic and cultural relevance, provide food, medicine, fuel, shelter and livelihood for people, thereby serving as great asset for food and energy security of country. The rich biodiversity of India and other countries of the world are under constant threats due to anthropogenic activities and change in global climate, as a result, its conservation requires utmost concern not only to safeguard the biological resources but also for the welfare of entire human civilization. There are thousands of species which are still unnoticed and unmonitored.

The relationships between land use and biodiversity are fundamental to understanding the links between people and their environment. Biodiversity can be measured in many ways. The concept covers not only the richness of species of a particular area but also the diversity of genotypes, functional groups, communities, habitats and ecosystems there. Changes in the quality, quantity and spatial configuration of different aspects of land use can impact different components of biodiversity. There are various alternative strategies besides wildlifefriendly farming which is used as land use strategy, to conserve biodiversity. Land sparing is one such option. There is also a need for brining coherence and working together of social scientists, ecologists and planers so as to integrate their approaches together; this will make studies on land use change and its consequences in a more holistic way.

Rapid land use and climate are projected to cause broad scale global land cover transformation that will increase microbial species extinction rates. Countries rich

in threatened species, which are also projected to have relatively high total future habitat loss, are concentrated around the equator. Various forms of pollution coupled with habitat fragmentation are responsible for loss of microbial diversity in soil. The article describes means of sustainable management of the soil microbial diversity.

India is blessed not only with rich biological diversity but also with the associated indigenous knowledge system of the same. The population burst, industrialization, urbanization, environmental pollution and global climate change are some of the factors that lead to loss of biological resources. Biodiversity is key for the ecosystem functioning and sustenance of the life form. Due to its importance, it becomes imperative to digitalized valuable biological resources that exist in India and its neighbouring region.

Today the humanity is facing a daunting challenge. The natural resources, both on land and water, are increasingly in demand to cater to the human needs and expectations. In order to feed burgeoning population of India and to attain food security, the mission oriented efforts for increasing food productivity and its sustainability through advanced agro and biotechnological means are to be ventured. But problems of climate change, biodiversity, desertification, water depletion, pollutants and toxicants, etc are being manifested, which in turn are becoming unfriendly to plant, animal and human health. There is an urgent need of developing methods to alleviate the environmental disorders in order to boost crop productivity. Soil health is defined as the continued capacity of soil to function as a vital living system, by recognizing that it contains biological elements that are key to ecosystem function within land use boundaries. Food security is defined as when people have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for active and healthy life. Future global environment change such as increased climate variability, land degradation and loss of biodiversity, in the context of social, political and economic changes, may bring unprecedented stress on food production system and food security. Soil health management, however, can play a significant role in climate change mitigation and adaptation to reduce the vulnerability of Indian agriculture. Although there is clearly an enormous number of people to feed worldwide, the high yields associated with mono cropping are not worth the long-term environmental and health costs of using fossil fuels and degradation of soil with chemical inputs. Integrated Nutrient Management, Organic farming, Biofertilizers, Bioremediation, Biocontrol and Plant Growth Promoting Rhizobacteria are important means for optimizing crop production on both short term and long term basis to achieve sustainable production without deterioration of the environment and at the same time maintain the soil fertility.

During my travels through India and the semi-arid state of Andhra Pradesh, I could not help but notice the ubiquity of rice cultivation. In an environment where the flora and fauna have adapted to a water limited hydrologic regime, flooded

rice patties dotted the landscape. Pumps in the corner of the fields could be seen spilling the region's limiting resource on crops that have become pervasive over the recent decades. Direct sun and the dry air seemed to create perfect conditions for significant water loss via evaporation. To me, it didn't quite make sense. I started to ask myself, what was grown in this region before these rice varieties? Where those landraces today, and what is their role in the context of food security? Dryland agriculture constitutes over 60% of total Indian agriculture and serves as a vital source of food for the country's rural poor (MINI, 2010). For thousands of years, people in the arid regions of India have been cultivating millets, sorghum and upland rice varieties that have evolved to be adapted in the water-limited environments. These crops provided a source of security for the people who cultivated them. The diversity of traditional crops maintained soil health, required few external inputs, spread the risk associated with weather events, and provided for multiple securities other than meeting caloric requirements.

It is well known that due to impending climate change, there will drastic effects to agricultural productivity. In order to increase food production with demand from an ever increasing population, integration of multiple sources to combat climate change will be necessary. Those affected the most by these changes will be underdeveloped and developing countries. In the face of global climate change, India, the second most populous country, must utilize all resources whether genetic, technical, or agronomic to ensure adequate food and water production for the projected increase in population. Preparing for global climate change is possible through collective efforts on a national and global level and will help alleviate any problems we encounter in the future.

Crop protection includes a variety of strategies used to decrease crop damage due to pests and diseases. These methods include the use of pesticides, cultural practices, biological control organisms, Integrated Pest Management (IPM), genetically modified plants (GMO) and insect pest and disease resistant crop varieties and cultivars. More sustainable alternatives to current pest control practices should be researched and developed such as organic farming. Only by improving these areas will India be able to feed its growing population and eradicate extreme poverty and hunger.