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मीना गुप्ता

सचिव

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Secretary



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FOREWORD

Drylands, covering about 41% of the earth's land surface and inhabited by more than 2 billion people, are one of the world's most challenging ecosystems. This is due to low rainfall, high temperature and limited soil moisture availability that impact land husbanding, the major occupation and livelihood earner for majority of the inhabitants. About 90% area of the drylands occurs in developing countries where the rising population depending on finite land resources for agriculture and related activities, contribute to land degradation resulting in depleted resources and poorer yield potentials.

About 70% (228.3 million ha) of India's total land area (327.9 million ha), spread over almost all the states of the country, except Goa, Kerala, and the states in the north-east and the islands, is classified as drylands, and consist of arid, semi-arid and dry sub-humid zones, where drought is a frequent visitor, land quality is variable, soils mostly shallow and impoverished, and yet agriculture is the predominant occupation since millennia.

Considering the fact that the evolved system of agriculture in the region and the wisdom of the inhabitants are the real assets on which the country's economy can bank upon, the Government of India has invested hugely since independence for the development of the country's drylands, be it for research and development to improve the productivity of agriculture, forestry and allied sectors, or for infrastructure development and other related sectors.

Since the area is vast and thickly populated, and people largely tradition-bound, new and upcoming technologies, or development programmes are slow to take root. Resource degradation, including that of soil and water, continues despite the various technologies and land use policies, so much so that a negative

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input-output balance is seen as a possibility in some areas. There is also a danger of biodiversity losses under constant pressure from the extending croplands to feed the growing population. There is also a threat to livelihood options. Despite these threats studies have shown that the country's agricultural, forage and wood production can be improved mainly through improvements in the drylands. Our researchers, technocrats, stakeholders and all those engaged in the well being of the nation are doing their best to contribute to this. The nation's objective of achieving poverty alleviation and food, fodder, forest and environment security, which are also Millennium Development Goals, can be achieved only through the concerted efforts of all its people.

The editors of the book "Dryland Ecosystem: Indian Perspective" have embarked on a wide range of topics dealing with the problems and management of drylands areas. This book is a step towards that realization, especially for making the arid lands more sustainable. I hope the critical reviews by the learned authors on different aspects of drylands and the future needs suggested would get the attention of all concerned.

I sincerely hope that this book will serve as a useful text reference for researchers and students engaged in pursuit of research and development in drylands areas.

2nd November, 2007



(Meena Gupta)

Chairperson, Indian National Man and
Biosphere (MAB) Committee and
Secretary, Union Ministry of
Environment and Forests,
Government of India

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PREFACE

Drylands cradled the global human civilizations, yet they are one of the world's most challenging ecosystems. India has about 70% of its land area under the drylands, with a high density of human and livestock population, as well as an evolved agricultural production system that varies from arid to semi-arid and dry sub-humid zones. Under a favourable natural endowment and with irrigation support, states like Punjab and Haryana in the drylands spearheaded the country's Green Revolution. However, with time crop yields in these traditional grain bowls are showing signs of diminishing returns with the inputs, necessitating a search for means to increase productivity from the rainfed drylands. Drylands are, however, beset with many problems: frequent drought, land degradation, soil nutrient deficiencies, water scarcity, higher risk for crop growing, etc., all of which make the task difficult, though not insurmountable.

To meet the challenge, it is time to make a holistic assessment of the region's resources, as well as of the scope for diversification, value chains, and integration of agriculture with environment in such a manner that the ecosystem production is sustainable, and livelihood from land-based activities more secure. The arid regions, which are more vulnerable to drought and desertification, have high resource degradation, and are expected to bear the brunt of global climate change through higher temperatures, lesser rainfall with higher intensities and aberrant monsoon, will need greater attention.

Considering the above, experts with long experience in different fields of dryland research in India, and currently associated with leading Institutes like Central Arid Zone Research Institute (CAZRI), Arid Forest Research Institute (AFRI), Central Institute for Arid Horticulture (CIAH), Central Research Institute for Dryland Agriculture (CRIDA) and International Crops Research Institute for the Semi-arid Tropics (ICRISAT), were requested to contribute articles on specific and focused areas of research, summarizing the current knowledge, and indicating the future thrusts. This book is an edited version of the thirteen articles that were received on relevant fields.

Dr. Amal Kar and his colleagues, Dr. P.C. Moharana and Dr. S.K. Singh, from CAZRI assessed the current scenario of desertification in the arid western part of India, while Dr. Y.S. Ramakrishna and his colleagues from CRIDA provided an overview of the likely impact of climate change on agriculture in the



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arid and semi-arid regions of India. Dr. T.K. Bhati and Dr. N.L. Joshi of CAZRI discussed the farming systems prevalent in western Rajasthan. Dr. K.P.R. Vittal (CAZRI) and Dr. G.R. Chary (CRIDA) provided an overview of the dryland cropping systems and opportunities for diversification, both horizontal and vertical. Dr. V.P. Tewari (AFRI) summarized the criteria and indicators of sustainable forest management in India, while Dr. M.A. Khan (CAZRI) discussed the water and watershed management problems in the arid western Rajasthan. Dr. Ranjana Arya (AFRI) summarized the methods developed for afforestation of salt-affected lands in the arid areas. Dr. J.C. Tarafdar and Dr. Praveen-Kumar (CAZRI) reviewed the conditions of soil quality and soil fertility in arid lands. Diversification of agriculture in arid zone through horticulture has a bright future, as was brought out by Dr. T.A. More and Dr. D.K. Samadia (CIAH). Dr. S.I. Ahmed (AFRI) and Dr. M.P. Singh (CAZRI) discussed the integrated management of forest and agricultural insect pests of arid zone, while Dr. G. Singh, Dr. N. Bala, Dr. P. Kumar and Dr. Abha Rani (AFRI) discussed the dryland resource management issues. In a major review of the watersheds across the semi-arid tropics in Asia Dr. S.P. Wani of ICRISAT and his five colleagues from CRIDA, and three other institutes in China, Thailand and Vietnam showed how better land management and sustainable livelihood could be ensured through people's participation in the programmes. Dr. N.V. Patil and Dr. A.K. Patel (CAZRI) discussed the strength of livestock management as a sustainable livelihood opportunity in arid western Rajasthan.

The editors are grateful to all the above authors for acceding to their request, and for timely submission of manuscripts in suggested format. The Ministry of Environment and Forests, Govt. of India, readily agreed to finance the publication of the book, for which they are profusely thanked.

We hope that the book will help to understand the current scenario of the dryland ecosystem for taking up sustainable development activities within it. We also hope that the issues raised in the overviews would receive the needed attention from researchers, technocrats and planners.

EDITORS

Jodhpur
1 November 2007

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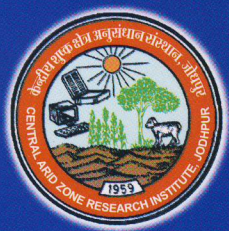
Dryland Ecosystem

Indian Perspective



Editors

K.P.R. Vittal | Amal Kar
R.L. Srivastava | V.P. Tewari
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