

The background of the cover is a photograph of the Thar Desert, showing rolling sand dunes under a clear blue sky. A few small green shrubs are scattered across the dunes. A vertical orange bar is positioned to the left of the title.

Thar Desert

*in Retrospect
and
Prospect*

**R. P. Dhir
D.C. Joshi
S. Kathju**

Thar Desert in Retrospect and Prospect

About the Authors



Dr. R.P. Dhir, a pedologist by specialization, has spent much of his professional life at the Central Arid Zone Research Institute, Jodhpur, India, and his job requirements took him to natural resource surveys, problem of desertification, settlement and land use evolutionary studies, use of saline water and each of these enriched knowledge about the problems and potentialities of a naturally disadvantaged Thar. The self-acquired proficiency in use of aerial photographs and satellite imagery together with experience gained from ground provided rare insights into natural resource-human use interactions. No less promising has been the natural archives, which have helped reconstruct the past climates of Thar. In a way these activities have continued even today. Dr. Dhir has made an effort to summarize the knowledge gained over the past nearly five decades.



Dr. D.C. Joshi, retired Principal Scientist (Soil Science), CAZRI, Jodhpur has over 35 years of experience working with interdisciplinary survey team in characterizing resources of the Thar Desert. He has been associated with soil resources appraisal and land degradation mapping soil characterization and investigating their chemistry, amelioration of soils degraded due to brackish water irrigation and digitization of soil resources of Rajasthan State. He was project leader of the Indo-Hungarian intergovernmental collaborative project on “Mapping of salt affected soils and management of soils irrigated with saline/high RSC (carbonate) water (1999-2002)”. He has efficiently and successfully coordinated World Bank aided NATP projects in Arid Ecosystem.



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hospitality of the people of the Thar*

&

*to the memory of scientists of the
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Foreword



The major challenges in the twenty-first century are: rapid increase in population, poverty, hunger, degradation of natural resources and adverse impact of global climate change. To address these, the world leaders met in 2015 and adopted new sustainable development goals (SDGs). Among SDGs, those related to agriculture are poverty, hunger, health/nutrition, gender empowerment, climate change, better management of land, water and energy and building of global partnership for sustainable development. It is well known that the natural resources in arid region of South Asia are 3-5 times more stressed compared to the rest of the world. Hence, achieving SDGs by 2030 in Thar region becomes a formidable task.

Since independence, India has made great advancements through science and technology, infrastructure development, human capital and institutional reforms. As a result, the agricultural sector has witnessed Green, White and Blue Revolutions resulting in increased production and productivity. Despite these, the natural resources in the arid region, which support the livelihood of a large chunk of population, is highly vulnerable to degradation. To address this, a modest research effort was launched in the year 1952 which over time has grown into major research establishment in the form of the Central Arid Zone Research Institute (CAZRI). It focused mainly on desert afforestation and soil conservation to begin with. Over the years, this centre has become a world class, multi-disciplinary institution for research and technology development. These efforts further got strengthened with the coming up of state agricultural universities, coordinated research projects and district level extension centres. Expansion of irrigation potential in Thar has also helped in increasing productivity and cropping intensity, resulting in crop diversification and enhanced income of resource poor farmers. However, the underlying constraint being faced in the arid-region is mainly the uncertainty of response to inputs due to uncertainty of rainfall.

On the contrary, arid region has rich agrobiodiversity, with some rare species of crops, trees and livestock in the world. Strategic use of the local germplasm together with some exotic species has paid rich dividends, including stabilisation of shifting sand dunes. Moreover, animal husbandry sector makes a big contribution to the economy of the region, besides its role for increasing individual household income, providing insurance against drought and scarcity, besides increased employment,

specifically for the women. In this context, the community grazing lands have played an important role for the upkeep of domestic animals of both farming community and the local pastoralists.

The Thar Desert of India presents over half a century-long history of technological developments and their application through a large program of desertification which was public funded. In addition, a large number of rural development programs comprising literacy, public health, roads and communications, employment generation and water security have helped in making grey areas green. These efforts have improved the livelihoods of smallholder farmers and also arrested migration. Nonetheless, all this has led to overexploitation of resources affecting adversely the development of the region. Hence, time is ripe for an introspection by reviewing efforts made in the past and to define future road map for inclusive growth and development of our arid-region.

All issues of concern in the Thar Desert and how effectively they have been addressed are synthesized well in this book. It will serve as a very useful document. In fact, the authors of this book have long experience of working in the arid zone. They have done a commendable job by writing this book which I am sure will be useful to researchers, extension workers, students and policy planners alike. I congratulate Dr. R.P. Dhir, Dr. D.C. Joshi and Dr. S. Kathju, the authors of this book, for their sincere efforts in bringing out this useful publication.



(R.S. Paroda)

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of Agricultural Research Institutions (APAARI)

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Preface

Deserts have always been fascinating for their natural scenery, wilderness, traditionalism of people and in some cases also for their being seat of civilizations that perished for one or the other reason. However, for the people destined to make a living in this harsh setting, life is full of hardships created by poor resource base, paucity and uncertainty of livelihood means, and a relative isolation from the mainstream and the Thar Desert is no exception. The scientists and technicians working in the far flung field stations during the early investigational period experienced also some of these hardships. Besides the physical hardships of terrain, practically non-existent infrastructure and the rudimentary camping sites made their stay and work challenging and inefficient. But then, the outcomes were something original, scientifically valuable and personally satisfying. One of the major activities then had been the natural resource surveys by a multidisciplinary team of scientists, a basic necessity envisioned by a well-meaning and highly experienced Australian scientist, Mr. C.S. Christian, a UNESCO advisor, for preparing a blue print of arid zone research in our country. The interactions within the team of subject matter specialists from diverse disciplines, already fatigued by day's grueling were tough and at times bitter, but these brought in a rare degree of understanding and even an appreciation of others view point for a holistic understanding of the natural endowments. This effort generated a voluminous multidisciplinary data on natural resources that were unique in several respects and had been handy then and even today, in a comprehensive assessment of behavior and management and in development planning domain.

Another unique advantage of field work was that by necessity or individual's choice, it provided an opportunity to directly interact with farmers and pastoralists, rural artisans and other stake holders. This enabled realization and an appreciation of the relevance of traditional management and in providing insights to inherent constraints that impinge upon human effort for an improved and sustainable resource management based on a limited experimentation. There is a report that camel breeders had over 150 indigenous practices that have stood them in good stead, and of these sixty are relevant even at present. Such an appreciation for wisdom and knowledge of desert dwellers only intensifies with time. However, for agriculture in general and irrigated farming in particular, large dimensional changes in terms of intensity of cropping, crop varieties, use of cash inputs and mechanization of field operations have taken place that necessitate use of modern tools and inputs.

As will be seen even from a cursory look, the book is multifaceted and covers widely varied topics from past climate fluctuations, natural endowments, human settlement and land use histories, socio-economic developments to possible consequences of global warming. The small group, which has attempted the current effort, however sincere, can not do full justice to the entire gamut of subjects. Available literature was consulted. To improve understanding further consultations were held with specialists across board. However, the discussions in several cases applicability of technologies remained inconclusive or lacked mutual understanding. Therefore, surely experts in respective fields may find some inadequacies or disagreement. But this will serve also one of the purposes of the book, which is to provoke more rigorous interaction with multitude of stake holders.

As part of rural development and strengthening of livelihoods across the country, the Thar has also received due attention. Besides, there have been special programs for rehabilitation of desert, which include the Desert Development Program, and of course the huge irrigation program. All these have brought in profound changes in social, economic and lifestyle, and in capacity at household and State level to withstand drought and the attendant misery. Though an effort has been made to touch upon these topics, but detailed studies are needed to decipher better the attitudinal, behavioral and economic impacts of these developments. Likewise, the contribution and transformatory role of urbanization, industrial development, rural infrastructure and other employment generating activities remain under-researched.

As just mentioned, the effort involved interaction and discussion with fellow scientists of varied specialties from different institutions and disciplines. The list is too long to acknowledge each one of them individually, but their generous co-operation is worthy of our deep gratitude. The liberal use of facilities of library at CAZRI and for that matter at other institutions is profusely acknowledged. Interaction with scientists engaged in extension and with grass root level workers of non-governmental organizations, like the *Gramin Vikas Vigyan Samiti*, has further helped in updating knowledge and in understanding of complexional changes in attitudes and aspirations of desert dwellers that have taken place recently in response to increased human population pressure in form of reduced incidence of fallow farming and a painful loss of output from open access lands. Special mention is made in this regard of Shri Prahlad Singh of School of Desert Sciences for brainstorming meetings on the evolving agrarian scenario.

R.P. Dhir
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