

Desert Ecology

Ishwar Prakash



**SCIENTIFIC
PUBLISHERS**

SCIENTIFIC REVIEWS ON ARID ZONE RESEARCH, 5

DESERT ECOLOGY

[Proceedings of National Symposium on Desert Ecology]

Organised by

The University of Rajasthan, Jaipur
and
The National Academy of Sciences, Allahabad

Edited by

ISHWAR PRAKASH

Professor of Eminence
Central Arid Zone Research Institute
Jodhpur - 342001 India



Published by

SCIENTIFIC PUBLISHERS (INDIA)

5 A, New Pali Road, P.O. Box 91

Jodhpur 342 001 (India)

E-mail: info@scientificpub.com

Website: www.scientificpub.com

Re-Print : 2019

1st Print : 1988

© 2019, Author

All rights reserved. No part of this publication or the information contained herein may be reproduced, adapted, abridged, translated, stored in a retrieval system, computer system, photographic or other systems or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the publisher.

Disclaimer: Whereas every effort has been made to avoid errors and omissions, this publication is being sold on the understanding that neither the editors (or authors) nor the publishers nor the printers would be liable in any manner to any person either for an error or for an omission in this publication, or for any action to be taken on the basis of this work. Any inadvertent discrepancy noted may be brought to the attention of the publisher, for rectifying it in future editions, if published.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

ISBN: 978-93-88172-92-9 [HB]

978-93-88172-93-6 [PB]

© 1988 by Scientific Publishers, Jodhpur

Visit the Scientific Publishers (India) website at

<http://www.scientificpub.com>

Printed in India

Foreword

Deserts, by definition, are zones of scarcity and hardships, yet some of the oldest civilizations have emerged in these areas. The arid zones exhibit a spectacular and vivid biotic diversity and an interesting rural environment, dominated as everywhere else, by Man. The desert dwellers humans, animals and plants — are generally well adapted to face problems of paucity of water, food and shelter and until recently an excellent equilibrium had been maintained between the resources available in these areas and their utilization so that the ecological balance had not been seriously disturbed. However, in the second half of the present century, developmental activities initiated in the deserts to cope the problems associated with the exhalation of human as well as livestock populations have brought, in their trail, considerable deterioration in desert habitat and ecology which has attracted the attention not only of national agencies but also international organizations like UNESCO, UNEP and FAO. It is felt that adequate and urgent steps should be taken to highlight the seriousness of the impact of man's activities and devise ways and means to combat the processes of desertification.

The Great Indian Desert or the Thar has been a priority area of concern for the Government of India as well as of environmentalists. Serious research and development activities are being carried out to enhance the productivity of our arid lands, based on principles of ecological management. In this context the work of the Central Arid Zone Research Institute, Jodhpur, India needs special mention.

When the University of Rajasthan, Jaipur invited the National Academy of Sciences, India to hold its 56th Session at Jaipur it was felt that not only the place (Jaipur is geographically located at the fringe of the Thar) but also the time was appropriate to use the opportunity to hold a National Symposium on Desert Ecology. The proposal received wide support and the Symposium was held under the joint auspices of the National Academy of Sciences, India and the University of Rajasthan from October 24th to 27th, 1986. Dr. Ishwar Prakash, Professor of Eminence at the Central Arid Zone

Research Institute, Jodhpur and Professor Dalbir Singh of the Department of Botany, University of Rajasthan, Jaipur kindly agreed to be the Conveners of the Symposium.

On behalf of the National Academy of Sciences, India it is my pleasant duty to record our sense of appreciation and gratitude to Prof. R. P. Agarwal, Vice-Chancellor and Prof. A. S. Kapoor, Department of Zoology, University of Rajasthan for their unceasing help and cooperation in every way in making local arrangements for the Symposium, to Prof. Ishwar Prakash and Prof. Dalbir Singh for acting as Conveners and finally to Dr. Ishwar Prakash, once again, for the arduous job of editing the Proceedings.

I also convey my gratitude to Messrs Scientific Publishers, Jodhpur for publishing the Proceedings in its present form.

U. S. SRIVASTAVA

General Secretary

National Academy of Sciences, India

Allahabad-211002

Allahabad

15th December, 1987

Editorial

It was indeed a happy occasion when the National Academy of Sciences and the University of Rajasthan decided to pool their intellectual and material resources for organizing a National Symposium on Desert Ecology in Jaipur during October 24-27, 1986. The choice of the theme for this symposium was most appropriate, “conquest of the desert” or “combating desertification” being enormously challenging tasks, particularly in view of the steep growth rates of both human and livestock population in the Thar desert. The ever-increasing demands on this scarcity stricken arid land for resources for the sustenance of life have been stressing the desert ecosystem beyond its limit of resilience. And then, when drought strikes here — as it does almost every 3 years — famine stalks the land, bringing untold miseries to man and his beasts alike. Ecologists believe that we are fast approaching the point of no return when the productivity of the desert biome in Rajasthan, even in good rainfall years, will be far below its potentiality. And, as the human and livestock pressure on the land increases, the desertification process would intensify. The potentially disastrous end-result of this web of man-animal-environment interactions warrants thorough and pragmatic analysis by experts drawn from various disciplines. The National Symposium proved to be a good forum for this purpose. Hopefully, the Proceedings of the Symposium will be of use to planners, scientists and technocrats in formulating integrated regional development schemes for the desert tract.

I thank the National Academy of Sciences for entrusting me with the responsibility of editing the Proceedings, and seeing the material through the press. In this task, I have received much enthusiastic technical and secretarial help from my colleagues — Dr. Mohd. Idris, Mr. B. K. Soni and Mrs. Bhavani Bhaskaran. I thank them all.

Ishwar Prakash

June 26, 1988
Central Arid Zone Research Institute
Jodhpur-342 001, India.

Contents

Foreword	iii
Editorial	v
List of Contributors	ix
1. Ecological degradation of the Thar desert and eco-regeneration K. A. SHANKARNARAYAN	..... 1
2. Flux in the Indian arid zone R. P. DHIR	..... 11
3. Man and the desert S. P. MALHOTRA	..... 25
4. Moisture regime variation and agricultural productivity in Rajasthan Y. S. Ramakrishna, B. V. RAMANA RAO, G. G. S. N. RAO AND N. L. JOSHI	..... 43
5. Floral wealth and plant adaptation of the Indian desert M. M. BHANDARI	..... 59
6. Adaptations of arid zone plants to soil water deficit A. N. LAHIRI	..... 73
7. Role of wild legumes <i>Indigofera hochstetteri</i> Baker and <i>Zornea gibbosa</i> Span in enriching the soil with nitrogen NAGENDRA BHARDWAJ, T. I. KHAN AND K.P. SHARMA	..... 81
8. Present status and future prospects of horticulture in arid zone B. B. VASHISHTHA	..... 91
9. Ecology of insect pests of xeric environment R. P. SRIVASTAVA	..... 101
10. Wildlife, human-animal interactions, and conservation in the Rajasthan desert ISHWAR PRAKASH	..... 113

11. Livestock population and ecological implications of overgrazing	
P. K. GHOSH, H. C. BOHRA AND S. P. GOYAL	..... 121
12. Detection and monitoring of desertification using remotely sensed data products	
S. S. DHABRIYA	..... 127
13. Salinity control and irrigated agriculture	
I. P. ABROL	..... 139
14. Canal irrigation in arid zone of Rajasthan and its ecological implications	
P. C. CHATTERJI AND S. K. SAXENA	..... 151
15. Irrigation and human settlements in Sri Ganganagar district	
G. S. NATHAWAT AND VINOD MAINA	..... 177
16. Greening the desert	
C. M. MATHUR AND D. P. GOVIL	..... 187
17. Landscape design with special reference to the arid zones	
SHEFALI PATHAK	..... 201
18. Renewable energy potential in arid areas of Rajasthan	
JAGDISH P. GUPTA, D. MISHRA AND P. SHARMA	..... 207
19. Future of the Indian desert	
H. S. MANN	..... 215

Contributors

I. P. ABROL

Dy. Director General
ICAR, Krishi Bhawan
New Delhi-110 001.

M. M. BHANDARI

Prof. of Botany
University of Jodhpur
Jodhpur-342 001.

NAGENDRA BHARDWAJ

University of Rajasthan
Jaipur-302 004.

H. C. BOHRA

Central Arid Zone Research
Institute
Jodhpur-342 003

P. C. CHATTERJI

Central Arid Zone Research
Institute
Jodhpur-342003

S. S. DHABRIYA,

Sr. Prof. Head
Remote Sensing Division
Birla Institute of Scientific
27, Malviya Industrial Area
Jaipur-302017.

R. P. DHIR,

Director
National Remote Sensing Centre
CAZRI Campus
Jodhpur-342003.

P. K. GHOSH

Central Arid Zone Research
Institute
Jodhpur-342 003

D. P. GOVIL

Forest Department
Jaipur

S. P. GOYAL

Wildlife Institute of India
Dehra Dun-220 003.

JAGDISH P. GUPTA

Central Arid Zone Research
Institute
Jodhpur 342 003

N. L. JOSHI

Central Arid Zone Research
Institute
Jodhpur-342 003

T. I. KHAN

Indira Gandhi Centre
University of Rajasthan
Jaipur-302003

A.N. LAHIRI

Central Arid Zone Research
Institute
Jodhpur 342 003

VINOD MAINA

University of Rajasthan
Jaipur-302 003.

S. P. MALHOTRA

Central Arid Zone Research
Institute
Jodhpur 342 003

H. S. MANN

D-42 Sarabha Nagar
Ludhiana-141 001 (Punjab)

C. M. MATHUR
Chief Conservator of Forests
19, Gopalbari
Jaipur-302 001.

D. MISHRA
Central Arid Zone Research
Institute
Jodhpur 340 003.

G. S. NATHAWAT
University of Rajasthan
Jaipur-302 004.

S. PATHAK
J. K. Synthetic Limited
Kota-342 003.

ISHWAR PRAKASH
Professor of Eminence
Central Arid Zone Research
Institute
Jodhpur-342 003.

Y. S. RAMA KUMAR
Central Arid Zone Research
Institute
Jodhpur-342 003.

G. G. S. N. RAO
Scientists S-2 (Agri. Met)
Central Soil & Salinity
Research Institute
Karnal.

B. V. RAMANA RAO
Senior Climatologist
Central Institute for Dryland
Agriculture, Santosh Nagar
P.O. Saidabad
Hyderabad-500 659.

S. K. SAXENA
Central Arid Zone Research
Institute
Jodhpur-342 003.

K. A. SHANKARNARAYAN
Central Arid Zone Research
Institute
Jodhpur-342 003.

K. P. SHARMA
Indira Gandhi Centre
University of Rajasthan
Jaipur-302 003.

P. SHARMA
Central Arid Zone Research
Institute
Jodhpur-342 003.

R. P. SRIVASTAVA
Prof. of Entomology
Sukhadia University
Udaipur.

B. B. VASHISHTHA
Central Arid Zone Research
Institute
Jodhpur 342 003.