



# **Agroforestry for Sustained Productivity in Arid Regions**





# **Agroforestry For Sustained Productivity in Aird Regions**



# **Agroforestry For Sustained Productivity in Arid Regions**

Editors

**J.P. Gupta | B.M. Sharma**

Central Arid Zone Research Institute

Jodhpur - 342 003, INDIA



Published by:  
Scientific Publishers  
5A, New Pali Road, P.O. Box 91  
Jodhpur 342 001, India  
E-mail: [info@scientificpub.com](mailto:info@scientificpub.com)  
Website: [www.scientificpub.com](http://www.scientificpub.com)

**Print : 2019**

All Rights Reserved. No part of this publication may be reproduced or distributed in any form or by any means without the prior written permission of the publishers.

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 of chapters in edited volumes) 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 publishers, for rectifying it in future editions, if published.

ISBN: 978-81-72331-55-9 (Hardbound)  
ISBN: 978-93-87991-03-3 (E-book)

© Editors, 1997

Printed in India

## FOREWORD

Arid lands occupy about 12% geographical area of the country. In spite of harsh environment and low crop production, these are inhabited by vast population of human beings and livestock. The livestock population (ACUS) is expected to be 11.3 million (about 17.6% over 1983 level) and the fodder requirement will be around 28.2 m tonnes in 2000 AD. To meet this increasing demand there is over-exploitation leading thereby to desertification and degradation of land, water and vegetation resources. In view of this there is an urgent need for developing and use of integrated farming systems for efficient utilization of land and water resources and sustained production. Agroforestry, silvi-pasture, agri-horticulture are some such systems which can provide stability and sustainability to the region.

Dr. J.P. Gupta and Dr. B.M. Sharma have compiled information on these aspects in the form of a book entitled, "*Agroforestry for sustained productivity in arid regions*". I am sure this will be of great use to the scientists and other agencies engaged in development of the arid areas.

**(R.S. Paroda)**

Secretary, DARE

Government of India

and

Director General

Indian Council of Agricultural

Research New Delhi





## PREFACE

Agroforestry is an integrated land use system combining trees, crops and/or animals for sustained production of grains, fuel wood, fodder and other products of economic value. This system had been *in vogue* in arid areas since time immemorial possibly for efficient utilization of meagre and off season rainfall, nutrients and also for providing economic security and environmental protection. In recent years, arid regions registered an alarming increase in population of human beings and livestock. This has put tremendous pressure on agricultural lands, forest lands and grazing lands. As a result of this even the marginal and submarginal lands are put under cultivation. There is deforestation and degradation of grazing lands for meeting fuel wood and fodder needs. The net result is degradation and desertification. These processes need to be halted and reversed. For achieving this objective, Central Arid Zone Research Institute (CAZRI), Jodhpur initiated work on the development of different agroforestry systems for different land types and agro-ecological sub-regions. Lot of valuable information has been obtained on various aspects of agroforestry systems, improved genotypes of trees and grasses, soil and water conservation, nutrient-dynamics, socio-economic conditions and transfer of technology. This information has been compiled in the form of this publication. It is hoped that the information contained in this volume will be valuable to researchers, extension workers and all others engaged in development of the arid regions.

**J.P. Gupta**

Head of Division

&

**B.M. Sharma**

Sr. Scientist,

Division of Resource Management

Central Arid Zone Research

Institute, Jodhpur-342 003



## THE CONTRIBUTORS

**R.K. Aggarwal**  
CAZRI, Jodhpur

**R. Raj. Bhansali**  
CAZRI, Jodhpur

**L.P. Bharara**  
CAZRI, Jodhpur

**T.K. Bhati**  
CAZRI, Jodhpur

**H.C. Bohra**  
CAZRI, Jodhpur

**R.K. Goyal**  
CAZRI, Jodhpur

**J.P. Gupta**  
CAZRI, Jodhpur

**B.L. Jain**  
NBSS & LUP, Udaipur

**S.K. Jindal**  
CAZRI, Jodhpur

**D.C. Joshi**  
CAZRI, Jodhpur

**S. Kathju**  
CAZRI, Jodhpur

**Praveen Kumar**  
CAZRI, Jodhpur

**B.K. Mathur**  
CAZRI, Jodhpur

**P.R. Ojasvi**  
CAZRI, Jodhpur

**M.P. Rajora**  
CAZRI, Jodhpur

**A.S. Rao**  
CAZRI, Jodhpur

**A.V. Rao**  
CAZRI, Jodhpur

**S.S. Rathore**  
CAZRI, Jodhpur

**S.K. Saxena**  
CAZRI, Jodhpur

**A.K. Sharma**  
CAZRI, Jodhpur

**B.M. Sharma**  
CAZRI, Jodhpur

**S.K. Sharma**  
CAZRI, Jodhpur

**K.C. Singh**  
CAZRI, Jodhpur

**M.P. Singh**  
CAZRI, Jodhpur

**R.N. Singh**  
CAZRI, Jodhpur

**K.R. Solanki**  
NRCAF, Jhansi

**J.C. Tewari**  
CAZRI, Jodhpur

**M.S. Yadav**  
CAZRI, Jodhpur



# CONTENTS

## List of Contributors

ix

1.	Arid zone soils and their suitability for agroforestry — <i>D.C. Joshi</i>	1
2.	Climatic features and their modifications through agroforestry — <i>A.S. Rao</i>	13
3.	Traditional agroforestry systems in western Rajasthan — <i>S.K. Saxena</i>	21
4.	Some alternative production systems and their management for sustainability — <i>J.P. Gupta</i>	31
5.	Some improved silvipastoral systems for sustainable production — <i>S.K. Sharma</i>	41
6.	Integrated farming systems for higher and sustained productivity in watersheds of arid areas — <i>T.K. Bhati</i>	47
7.	Shelterbelt Management for environmental improvement in hot arid ecosystem — <i>A.K. Sharma and J.P. Gupta</i>	55
8.	Management of degraded grasslands in arid regions of Rajasthan — <i>K.C. Singh</i>	61
9.	Nutrient cycling in agroforestry — <i>B.M. Sharma</i>	69
10.	A conceptual model for the evaluation of agroforestry systems — <i>P.R. Ojasvi and R.K. Goyal</i>	79
11.	Role of legumes alongwith biofertilizers in agroforestry systems for higher plant productivity — <i>A.V. Rao</i>	89

---

12.	Water relations of desert vegetation	— <i>S. Kathju</i>	99
13.	Soil fertility management in agroforestry systems	— <i>R.K. Aggarwal and Praveen Kumar</i>	107
14.	Feed resources of Indian arid zone : Their nutritive value for the livestock	— <i>H.C. Bohra and B.K. Mathur</i>	113
15.	Potential role of agroforestry in arid zone in 2000 AD	— <i>B.M. Sharma and J.P. Gupta</i>	117
16.	Insect pest management in agroforestry	— <i>M.P. Singh</i>	125
17.	Diseases of desert trees and their management	— <i>R. Raj Bhansali and S.K. Jindal</i>	135
18.	Important fodder trees of arid zone and their management	— <i>J.C. Tiwari</i>	149
19.	Genetic improvement of tree species suitable for arid zone	— <i>K.R. Solanki</i>	157
20.	Improved varieties of pasture grasses and their cultivation	— <i>M.S. Yadav and M.P. Rajora</i>	167
21.	Social issues in agroforestry land use systems on arid lands	— <i>L.P. Bharara</i>	171
22.	Development of degraded pasturelands in arid region- A case study	— <i>S.S. Rathore, B.L. Jain and B.M. Sharma</i>	187
23.	Transfer of agroforestry technology in arid zone- A case study	— <i>R.N. Singh</i>	195