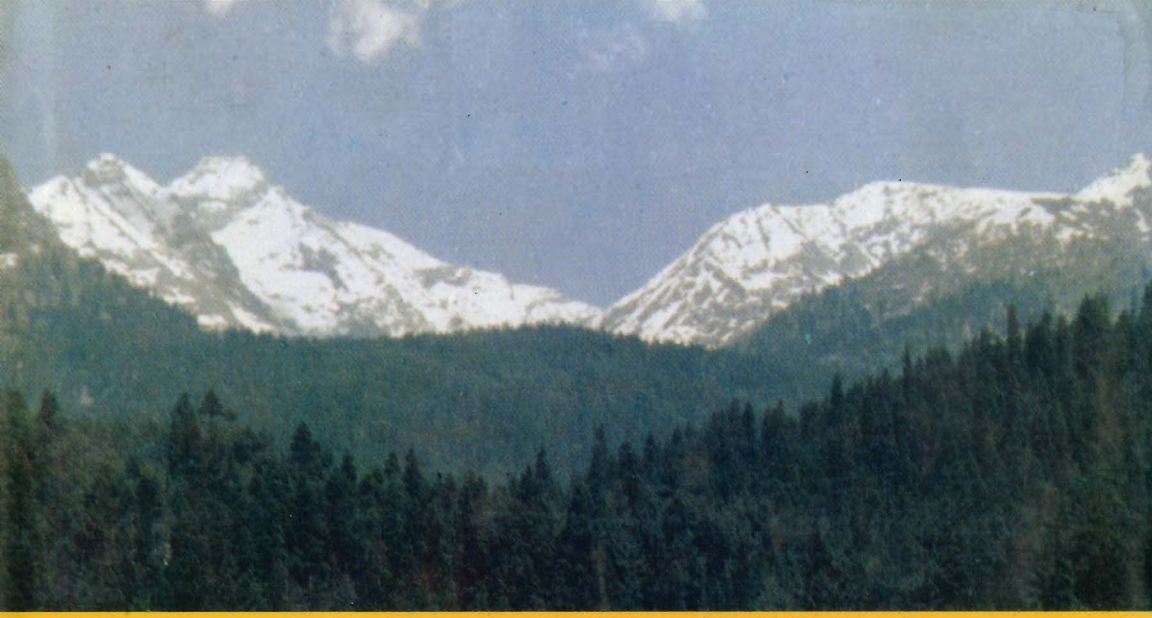

BEEKEEPING

In Integrated Mountain Development

L. R. VERMA

This important and interesting book on apiculture is unique in the sense that, besides presenting a comprehensive review, on scientific and practical aspects of beekeeping, it covers the economic and developmental aspects of apiculture as a cottage industry and analyses its prospects based on the ecological resources and socioeconomic conditions prevailing in the Hindu Kush-Himalayan region. Against this background, the conclusions and recommendations drawn by the author will be relevant to other developing countries.

This analysis of a diverse but specialized subject will be of immediate use to agricultural and other applied scientists, extension workers, policy makers, planners, and aid agencies and also go far beyond the sphere of its primary users to propagate the knowledge concerning the intrinsic value of bees and beekeeping to environment and society as a whole.

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Supported by

International Centre for Integrated Mountain Development
Kathmandu, Nepal

ICIMOD Senior Fellowship Series, No. 4

OXFORD & IBH PUBLISHING CO. PVT. LTD
New Delhi Bombay Calcutta

Supported by

International Centre for Integrated Mountain Development
G. P. O. Box 3226, Kathmandu, Nepal

Library of Congress Cataloging in Publication Data

L.R. Verma
Beekeeping in Integrated Mountain Development
Economic and Scientific Perspectives
(ICIMOD Senior Fellowship Series)

ISBN 81–204–0538–2

Published in India by Mohan Primlani for Oxford & IBH Publishing Co. Pvt. Ltd., 66 Janpath, New Delhi 110 001, composed by Laserwords, Madras, and processed and printed by Rekha Printers Pvt. Ltd., A-102/1 Okhla Industrial Area Phase II, New Delhi

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Dedicated to my father

SHRI CHET RAM

who even from a very remote village of the Shimla hills
enabled me to adopt a career in
scientific teaching and research

CONTENTS

Foreword

Throughout the developing countries of the world, mountain areas have been characterized by predominant subsistence economies which are now becoming critical. There can be no doubt that mountain resources and environments are deteriorating at an unprecedented rate and that increasing numbers of people and mountain communities are under considerable stress. Such tendencies are more pronounced in the agricultural sector which, defined broadly, includes all land-based activities, such as crop farming, horticulture, forestry, and livestock rearing. Many small and marginal farmers, as well as the landless, do not produce sufficient food or earn sufficient income to feed their families adequately throughout the year. Concentrated efforts to overcome these problems have been made over the past 10 years, but the results so far have been quite negligible. Under these circumstances, alternative strategies for sustainable mountain agriculture should entail full exploitation of underutilized resources in order to diversify the income and food sources of mountain people; giving due consideration to ecological sustainability and environmental safeguards.

Mountain Farming Systems' programmes at ICIMOD are aimed at the search for such non-landbased activities or options in the context of the sustainable development of mountain agriculture in terms of resource base availability, resource use/management practices, and production flow. Within this context, ICIMOD has identified beekeeping (Apiculture) as one such income- and food-generating activity which offers comparative advantages for mountain areas with positive ecological consequences. Beekeeping has been closely linked with the cultural heritage of the rural mountain population. This activity offers options for communities in the economically marginal category, because it is a low investment activity. In addition, it is flexible enough to match any scale of operation or any category of manpower. Hive products are in demand both locally as well as in foreign markets. The pollination activities of honeybees boost the productivity of several mountain crops and help in the conservation of forest and grassland ecosystems.

This book, "Beekeeping in Integrated Mountain Development: Economic and Scientific Perspectives", was written by Professor L.R. Verma during his tenure as a Senior Research Fellow at ICIMOD. This Senior Research Programme has been facilitated by a grant from Ford Foundation. Such a fellowship programme enables senior and distinguished professionals to undertake a period of individual "sabbatical" research and publication on a subject of direct relevance to key issues of integrated mountain development. The award of this fellowship to Professor Verma, a well-known authority on apiculture, was an appropriate choice, keeping in mind the vital importance of this subject in sustainable mountain farming systems and integrated rural development.

This important and interesting book on apiculture is unique in this sense that, besides presenting a comprehensive review on scientific and practical aspects of beekeeping, it covers the economic and developmental aspects of apiculture as a cottage industry and analyses its prospects based on the ecological resources and socioeconomic conditions prevailing in the Hindu Kush-Himalayan region. Against this background, the conclusions and recommendations drawn by the author will be relevant to other developing countries.

It is my hope that Professor Verma's professional analysis of a diverse but specialized subject will be of immediate use to agricultural and other applied scientists, extension workers, policy makers, planners, and aid agencies and also go far beyond the sphere of its primary users to propagate the knowledge concerning the intrinsic value of bees and beekeeping to the environment and society as a whole.

E.F. TACKE
Director, ICIMOD

Preface

Apiculture (Beekeeping) as a non-landbased income-generating activity is now becoming an important component of present-day strategies for sustainable mountain agriculture and integrated rural development programmes. The role of beekeeping in improving the subsistence economy of rural communities, especially those living in the developing countries of the Hindu Kush-Himalayan region, cannot be overlooked as it has always been linked with the cultural and natural heritage of mountain ecosystems and their people.

In recent years many valuable books have been published on beekeeping with the European honeybee, *Apis mellifera*, especially for use in developed countries, but still there is hardly a single reference book available on the Asiatic species of honeybees which require a different beekeeping perspective due to different ecological resources, technological levels, and socioeconomic conditions. To bridge this gap, Dr. Colin Rosser, Director, ICIMOD, offered me a Senior Research Fellowship, funded by Ford Foundation, to review the state-of-the-art in this important subject and also to suggest strategies for its further development and improvement, especially in the Hindu Kush-Himalayan regions.

The first section of this book (Chapters 1 to 5) is intended to serve as a guide to policy makers, planners, administrators, rural developers and agricultural and forestry experts to make them aware of the importance of beekeeping in providing extra food, cash income, nutritional benefits, pollination of crops, employment, and improvement of environmental health. It is hoped that this section will arouse considerable interest in Government, non-Government, and funding agencies for their continuing commitment to beekeeping development programmes. The second section (Chapters 6 to 9) deals with the scientific and practical aspects of beekeeping with both native and exotic species of honeybees. It focuses on their biology and management based on ecological and appropriate technological considerations for the Hindu Kush-Himalayan countries. In this section, an attempt has been made to review the up-to-date literature on apicultural research and devel-

opment programmes, in this region, that is suitable for researchers, extension workers, and beekeepers; as well as for classroom reference. Finally, conclusions and recommendations are drawn for the promotion and development of the beekeeping industry in Asia in general and in the Hindu Kush-Himalayan region in particular.

L.R. VERMA

Acknowledgements

This book could not have been completed without the valuable contributions and active cooperation of several individuals and institutions. I particularly wish to express my sincere thanks to Dr. E.F. Tacke, the current Director of ICIMOD, for his keen interest, advice, and encouragement; for providing necessary facilities in ICIMOD, for arranging for its publication; and for writing the foreword to this book. I also owe a great deal to Dr. Colin Rosser, the former Director of ICIMOD, who was quick to realize the importance of beekeeping for sustainable mountain development and showed deep personal interest in this subject. I shall remain indebted to him for the award of the fellowship and for his initial and continuing support for this work. Prof. K.C. Malhotra, Vice-chancellor H.P. University, Shimla, India, was kind enough to grant me sabbatical leave for the completion of this book.

Among my former and present graduate students from the department of Bio-sciences, Himachal Pradesh University, Shimla, I am especially thankful to Dr. V.K. Mattu, Dr. P.C. Dulta, Dr. B.S. Rana, Dr. M.P. Singh, Dr. Neelam Mattu, Dr. R.S. Rana, Miss Roopa Kumari, Miss Usha Mahajan, Miss Leelamma, Miss Alka Sharma, Miss Anju Sharma, Mr. P.C. Sharma, Mr. Pushpinder Chauhan, Mr. Vipin Kumar, Miss Sanjeevan and Miss Maya. Various data have been drawn from their graduate theses and publications.

I have made extensive use of the International Bee Research Association Library in Cardiff, U.K., and this is gratefully acknowledged. I must express my gratitude to Dr. Eva Crane, Honorary Life President and Scientific Consultant to the International Bee Research Association, Cardiff, Wales; Prof. Dr. F. Ruttner, Director, Institut für Bienenkunde, Goethe University, Frankfurt, West Germany; Dr. Rafiq Ahmad, Chief Scientific Officer, NARC, Islamabad, Pakistan; and the Bureau of Indian Standards, New Delhi, for their permission to use original tables and figures.

I benefited tremendously from various discussions with Dr. Tej Pratap. Many other colleagues in ICIMOD, especially Dr. Ram Yadav,

Mr. Surendra Shrestha, Dr. Mahesh Banskota, Dr. N.S. Jodha, Dr. S.S. Teaotia, and Dr. M.S. Rathore also helped me in my endeavours.

Special appreciation is extended to Miss Miriam Bishop, U.S. Peace Corps Volunteer, in Nepal, for critically reading this manuscript and to Ms. Reeta Rana, Mr. Rajendra Shah, and Mrs. Sami Joshi for their tireless and devoted efforts in typing the manuscript.

Lastly, I am thankful to my wife Dr. Savitri Verma for her intellectual stimulation and inspiration during this work and to my daughters for their support and understanding.

L.R. VERMA