

# Pollination Management of Mountain Crops through Beekeeping

## Trainers' Resource Book



Uma Partap

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*Uma Partap*

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International Centre for Integrated Mountain Development  
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# Preface

The ongoing transformation of mountain agriculture from subsistence to cash crop farming poses new challenges to improving and maintaining crop productivity. Among these challenges are crop failure due to lack of pollination. Evidence of this problem has been documented by ICIMOD through work carried out in several mountain areas of the Hindu Kush-Himalayan region. This work has revealed that pollination failure could be due to a number of reasons: scarcity of insect pollinators, continuous increase in the cultivation of self-incompatible crop varieties, lack of an appropriate polliniser ratio, climatic factors, and so on. Among these, the scarcity of natural insect pollinators is a key factor. While progressive farmers are trying various ways, such as hand pollination and bouquet pollination, to make up for the scarcity; others are suffering the losses. However, these methods of pollination management are expensive and time consuming. Alternatively, the use of the hive bees, *Apis cerana* and *Apis mellifera*, is a possible low-cost and farmer-friendly method of managing crop pollination.

The present publication is a part of ICIMOD's initiative to promote wider use of honeybees to contain declining crop productivity due to pollination failure. This resource book is for training extension workers and mountain farmers to use bees for pollination. It covers several topics related to managing bees for crop pollination. Several illustrations have been added to facilitate understanding of the various processes. The book provides a general introduction to pollination; explains the reasons why different kinds of bees are important crop pollinators; and describes how they pollinate a crop. It describes the limitations in using bees in traditional fixed-comb hives for crop pollination and explains the advantages of movable-frame hives. The role of the hive bees, *Apis cerana* and *Apis mellifera*, as crop pollinators rather than wild bees, and how to manage them for pollination of crops in general are described in detail. Descriptions of the management of hive bees for pollination of particular crops have also been given.

# Acknowledgements

I started working on crop pollination during 1991 under the guidance of Professor L.R. Verma (now Vice-Chancellor, Dr Y.S. Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh, India), who introduced me to this field. Under his supervision, I conducted many experiments on the impact of honeybees on the yield and quality of various fruit and vegetable seed crops. During 1996, while reviewing issues related to crop pollination, we found a serious problem in many crops of the Hindu Kush-Himalayan region. I then thought of sharing my experiences of crop pollination management using friendly insects – particularly hive bees. As a result, I prepared the framework of this manual and discussed it with colleagues in ICIMOD.

Many individuals were instrumental in producing the final version of this book. In ICIMOD, I am particularly grateful to Mr Egbert Pelinck, Director General; Dr Mahesh Banskota, Deputy Director General; Dr Tej Partap, Head, Mountain Farming Systems' Division; Mr K.K. Shrestha, Coordinator, Beekeeping Project; Dr Naomi Saville, Beekeeping Research and Extension Officer; Mr A.N. Shukla, Beekeeping Extensionist; and the staff of the Publications' Unit of ICOD, ICIMOD, for their continuing assistance in processing my work. Outside ICIMOD, I am very thankful to Mr Surendra Pradhan, Artist, for preparing the illustrations used in this manual. These illustrations are intended to make the manual easy to understand.

The final draft of the manual was critically reviewed by experts, and they included Dr Nicola J. Bradbear, President, Bees for Development, U.K.; Dr Harish K. Sharma, In-charge, Beekeeping and Horticultural Research Station of the University of Horticulture and Forestry, Katrain, Kullu district, Himachal Pradesh, India; Dr D. R. Gautam, In-charge, Horticultural Research Station of the University of Horticulture and Forestry, Kotkhai, Shimla district, Himachal Pradesh,

India; Mr Pratim Roy, Keystone, Nilgiris, India. Their comments were of great help in improving the manual.

I benefitted greatly from earlier publications in terms of ideas for illustrations. I especially acknowledge Pest Control Safe for Bees by Dr Margaret Adey, Dr Penelop Walker and Dr Peter Walker; Pollination of Cultivated Plants in the Tropics by Dr D.W. Roubik; Training Leaflets by the HMG/SNV Beekeeping Training and Extension Support Project; and Bees and Beekeeping: Science, Practice and World Resources by Dr Eva Crane.

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I express my heartfelt thanks to my family, especially my young daughters Bhoomika and Uttara, for their support, patience, and understanding when I was busy preparing this manual.

Uma Partap  
February 1999

# Summary

At present, both yield and quality of mountain cash crops are declining. This is mainly because of a decrease in the populations of natural insect pollinators. This has created a need to manage hive bee species such as *Apis cerana* and *Apis mellifera* for crop pollination. This manual has been prepared to help mountain farmers/orchardists/extension workers manage hive bees for pollination of crops.

This manual consists of seven chapters supported by illustrations intended to help those who are not too proficient in English. Chapter 1 provides a general introduction to pollination: self-pollination and cross-pollination; agents of cross-pollination; and the role/importance of cross-pollination in enhancing productivity and yield of mountain crops. Chapter 2 describes the reasons why different kinds of bees are important crop pollinators; how a bee pollinates a flower; a honeybee colony, its reproduction/multiplication (swarming) and absconding; and species of honeybees found in the Hindu Kush-Himalayan region.

Chapter 3 describes types of beehives – including traditional fixed-comb hives and modern movable-frame hives. Chapter 4 explains the role of hive bees in crop pollination and why they are better crop pollinators than wild bees. It also describes ways to manage hive bees for pollination of crops in general. Chapter 5 details the management of hive bees for pollination of particular cash crops. Chapter 6 provides examples of managed crop pollination using hive bees and wild bee species and the economic value of bee pollination. In response to the increasing use of pesticides, Chapter 7 suggests ways that crop growers and beekeepers can protect bees from their harmful effects.

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