

The Challenges to the Promotion of Managed Crop Pollination

The emerging need for managed crop pollination in HKH agriculture is very timely, in the sense that stray cases of crop failure through lack of sufficient pollination are being noticed by farmers and there are increasing reports of threatened extinction of the basic resource for the solution, the *A. cerana* honeybee. Combining conservation of bee species with development option seems the logical way forward.

Knowledge Gap and Research Needs

While raising awareness about the need for managed crop pollination with the information and knowledge available is one thing, a big challenge confronts researchers. Even before policy-makers and development agencies begin to make use of this option on a wider scale in mountain agriculture, the gaps in our knowledge need to be closed. Several questions still remain unanswered in this respect; e.g., when mountain farmers record (or will record) declines or total failures in crop yields due to lack of pollination (confirmed by scientific studies), it may be due to the reasons given below.

- The crops were not pollinated because natural insect pollinators were killed by pesticides (a common accusation).
- Full crop pollination failed in a particular mountain valley because the area under crops far exceeded the number of plants for which natural populations of insect pollinators, including honeybees, were able to offer pollination services.
- The fruit set was observed to be hopelessly poor, despite good blossoms of peaches, cherries, apples, and other crops in cold mountain areas where people might be keeping *A. mellifera*.

These three scenarios generate the following questions for research: are there enough populations of insect pollinators in mountain areas to help pollination of new, much larger cash crop areas? Or is the pollination failure because of the seasonality dimension? It could be that there might be enough insects, including

A. mellifera, but these are available in the summer season when other traditional crops might be flowering. Most of the introduced fruit crops in the HKH Region bloom in the spring when it is too cold for many insects to offer pollination services. Further, in the light of the above two points, it will not be safe to assume that all crop failures are because of insecticides. Also, research has not been carried out on other insect pollinators. Initiatives on commercial production of pollinators in the HKH Region, except for the use of honeybees in a few cases, have not been undertaken so far in any country, by any institution. These are some of the knowledge gaps. Scientists working in this field could list many more that have to be addressed before the concept of managed crop pollination is put to practical use.

Institutional Strengthening Needs: Research and Extension

Managed crop pollination is a relatively new area, and there are only a few institutions in the HKH Region that have explicit mandates and manpower capabilities with ongoing large-scale research and extension in this area. Most apicultural institutions focus on the honey production aspect and look on honeybee research and management mainly from that angle (Table 6). Similarly, development agencies promote beekeeping as a cottage industry to increase family incomes through the sale of honey. It was, in fact, assumed that nature would take care of the pollination of crops and, under normal circumstances, this was so. Therefore, there is a need to strengthen the research capabilities in order to underline applied research in key areas of managed crop pollination in mountain agriculture. Issues such as the extinction of *A. cerana* and its conservation needs have not been adequately addressed so far by the institutions in the HKH Region.

Mainstreaming Isolated Efforts through Policy Support

As reported, there have been a few instances of farmers using honeybees for pollination of crops in Himachal Pradesh in India and Yunnan in China. In these two provinces, government institutions are providing extension services to popularise the approach. These are only isolated cases, limited to a few areas. On the other hand, great efforts have been made to develop apiculture as a micro-enterprise/cottage industry. The result of these initiatives is that, today, mountain areas in Pakistan, China, and also in northwestern India have successful examples of apicultural enterprises, primarily for honey. However, the main missing link between the two is the explicit primary focus of apiculture for crop pollination. This dimension is missing in policy and planning approaches and, therefore, receives less research and dissemination attention, even though reasonable knowledge and information might exist, at least in some countries. Efforts are therefore needed to create conditions for inclusion of managed crop pollination in the priority areas of sustainable agricultural development and to emphasise the integration of managed crop pollination as a key component of agricultural development policies.

Table 6. The Research and Development Focus of Beekeeping Institutions in the HKH Countries

Country	Institution	R&D Focus
Afghanistan	National Beekeeping Programme	<i>A. mellifera</i> for honey production
Bangladesh	Tropical Bee Research and Training Institute, Naogaon	<i>A. mellifera</i> for honey production
China	Eastern Bee Research Institute, Yunnan Agricultural University, Kunming	<i>A. cerana</i> for honey and pollination research
India	• University of Horticulture and Forestry, Himachal Pradesh	Mainly <i>Apis mellifera</i> for honey and pollination research
	• H.P. Department of Horticulture	Mainly <i>A. mellifera</i> for honey and pollination research
	• Uttar Pradesh Department of Horticulture	Mainly <i>A. mellifera</i> for honey and pollination
	• Central Bee Research and Training Institute, KVIC, Pune	Mainly <i>A. mellifera</i> for honey and pollination
Myanmar	Beekeeping Department, Ministry of Livestock Breeding and Fisheries	<i>A. mellifera</i> for honey production
Nepal	Bee Development Programme, Department of Agriculture	Mainly <i>A. cerana</i> for honey as a cottage industry
Pakistan	Pakistan Agricultural Research Council (PARC), Islamabad	<i>A. mellifera</i> for honey production

Source: Compiled by the Authors

In the intensive farming zone where mostly cash crops are grown, such as Himachal Pradesh, the Swat area in Pakistan, and several counties in southwestern China, the bee industry is not fully used to meet the interests of crop husbandry and the cultivators incur great losses through the poor exploitation of bees for the pollination of flowers. Although experimental evidence proved that, with correct organisation of crop pollination by bees, the income from bee pollination of crops can increase 10-fold.

Under the conventional system of apiculture for honey production, not much profit is made from pollination. This is because, currently, apiarists receive little financial incentive from the pollination service they may be rendering. Their efforts are considered to be rewarded by the honey and wax produced by the bees. This way apiarists who may be helping pollinate crops are in fact encouraged to disrupt organisational measures for pollination of agricultural crops. Some examples are; e.g., not carrying the colonies to the fields at the proper time nor dressing the bees for pollination; these pose difficulties for good pollination.

Box No 4: Agricultural Perspective Plan of Nepal and Possible Linkages with Managed Crop Pollination (MCP)

The APP makes agriculture central to accelerated growth in Nepal. Increasing farm incomes through high-value crops is an acknowledged process for transforming agriculture. Most marginal lands will be put under perennial fruit cash crops of various kinds to improve their productivity; an ecologically and economically sustainable measure. APP intends to generate employment directly and through multipliers to non-farm rural employment. The strategy of managed crop pollination (MCP) using bees has the potential to play a central role in achieving these goals through defined strategies, inputs, outputs, and impacts. The relevant components of APP with potential to bring about benefits through linkages with MCP are as follow.

APP	MCP
I. Strategy: Urgent acceleration of agricultural growth; principles and strategic priorities	MCP as a strategic priority
II Priority inputs: Technology:	
- research and extension priorities	Incorporate MCP
- seed production	Need to incorporate MCP to ensure quality seeds
III. Priority outputs: high-value crops and agribusinesses:	MCP has a major role in maintaining quality and quantity
- commodity priorities	Cash crop farming needs integration with MCP
- investment and policy	MCP requires an explicit policy (not much investment)
- environment	<i>Positive contribution</i>
- agribusiness integration	Positive contribution
IV. Impact: poverty alleviation and food security	
- agricultural growth, employment	
- food security and nutrition	
- supplementary activities	
- better land use	MCP can make a useful contribution in each of these areas
- resource management	
- prioritised productivity package	
- income generation and poverty alleviation	

To counter this, it will be necessary to formulate strategies for wider use of managed crop pollination so that economic incentives for pollination services are made available according to the crops. This will encourage apiarists to prepare beehives of suitable strengths for pollination and better management of organisational work for pollination. The laborious work of increasing the strength of beehives for the pollination of orchards, with restricted nectar productivity from fruit plants, should be paid higher rates than work with crops such as sunflower that produce two to three times more nectar than fruit crops and which are pollinated with less effort on the part of apiarists. Seed-producing crops secrete even less nectar than orchards. In addition, these plants are visited less by bees unless special measures are taken to improve their flight activity.

The roles of regional and international institutions such as ICIMOD, the World Conservation Union (IUCN), World Wildlife Fund (WWF), and the Food and Agriculture Organisation (FAO) are important in the context of bringing awareness, supporting human resources' development, and carrying out policy research, leading to augmentation of the capabilities of national and provincial R&D institutions.

To sum up, we reiterate that adequate results from scientific experimentation and some experiences of managed crop pollination with honeybees are now available. These findings amply demonstrate that this is an effective and cheap biological means to improve and maintain the productivity of mountain agriculture. Further refinement of the technique might be necessary to make it acceptable to farmers in each agro-ecozone, in diverse farming environments, and for specific crops. Initiative is needed to make the potentials of managed crop pollination known to a wider group of stakeholders.

Integration of managed crop pollination as a component of agricultural development strategies is missing. So, to bring it into mainstream agronomic practices, managed crop pollination will have to fulfill other prerequisites of policy, research, extension support, and, above all, farmers' awareness of the benefits of managed crop pollination must be ensured.