Participatory Action Research on *Apis Cerana* Selection for Improving Productivity and Conserving Biodiversity: A Case Study from Alital VDC of Dadeldhura District

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Introduction

Apis cerana, the native hive bee of Asia, is the most valuable natural resource of beekeeping in the Hindu Kush-Himalayan (HKH) region and has been considered a vital component of the natural ecosystem. This species is equivalent to the European honeybee *Apis mellifera* in comb building, dancing, and nesting behaviours. Being native to the region, *Apis cerana* is better adapted to the local environment and to its co-evolved flowering plants, and can survive without supplementary feeding or medication. It is an excellent pollinator of early blooming mountain crops such as almond, apple, pear, plum, and different vegetable seed crops (Partap & Partap 1997; Verma & Partap 1993). However, it produces less honey and has some undesirable behavioural characteristics like frequent swarming, absconding, and robbing. For higher honey production, *Apis mellifera* has been imported in many parts of HKH countries and is becoming popular among commercial beekeepers. Surveys conducted by ICIMOD during recent years showed that the population of *Apis cerana* in the HKH region is declining (Partap 1999; Verma 1992).

Bee researchers, development workers, and pollination scientists warn that the decline in *Apis cerana* population may result in a loss of plant biodiversity in an area and create socioeconomic problems. As *Apis mellifera* beekeeping requires more resources (time, treatment against epidemic diseases and predators) and needs a high level of inputs in terms of capital and management, it is unsuitable for subsistence rural farmers/beekeepers (Pechhacker et al. 2001). Keeping this in mind, ICIMOD's beekeeping project has adopted a participatory approach to conduct action research on *Apis cerana* selection and multiplication in different areas of the HKH region to imporve the performance of the bee. Based on the richness of bee flora, prevalence of *Apis cerana*, and concentration of bee colonies, Alital VDC of Dadeldhura district in far western Nepal was selected as one of the potential sites, and 53 beekeepers were identified as action research partners.

The research seeks to improve the productivity and behavioural characteristics of *Apis cerana*. The participatory action approach calls for people's participation in every stage of the *Apis cerana* selection and multiplication process. This innovative programme is farmer managed, farmer supervised, and farmer operated.

The Action Research Programme

The approach used focuses on a group of people who participate in the action research process. Farmers are involved at every stage from data recording to colony management and data analysis. The project uses a dialogue-based participatory approach to enhance

local people's awareness and confidence, and to empower their actions. Staff professionals from ICIMOD and NGOs have roles as convenors, catalysts, and facilitators. The approach involved five basic steps: formation of beekeepers' groups/associations, enhancement of skills and capability, capital formation, improvement of beekeeping management techniques, and improvement of the productivity and behavioural characteristics of *Apis cerana* through selection.

Formation of groups or associations

For the effective selection and propagation of better stock, beekeepers need to have larger apiaries from which to choose more productive colonies. But most *Apis cerana* beekeepers are subsistence farmers keeping one or a few colonies in traditional fixed comb hives. To generate data from a large number of colonies, it is essential to organise beekeepers. Hence the project facilitated a series of meetings with beekeepers/farmers to discuss the issue and build consensus about the approaches, methodologies, and activities to be implemented in Alital VDC. The project also sensitised the community members to the benefits of working collectively and encouraged them to form a community organisation. As a result there is now a very dynamic group known as Alital Mauripalan Sumuh (Alital Beekeeper's Association; ABA). This association has both men and women members.

Enhancement of skills and capability

To bridge the knowledge gap and improve existing skills and capability, the group of action research farmers/beekeepers was trained in different aspects of beekeeping including hive making, colony management, queen rearing, data collection, and group mobilisation. The main objective of training was to develop knowledge, skills, and confidence in strengthening beekeeping activities at a community level. A variety of participatory training methodologies were used to make training as effective as possible. Practical aspects of the training were emphasised in preference to a classroom orientation. Training sessions were conducted at an active beekeeping site where trainees had an opportunity to do hands-on work. The training encouraged participation of beekeepers who are keeping bees and need such support and help. Women beekeepers were especially encouraged to participate.

Capital formation

Capital is an essential input for any development work. Although currently many of the activities related to this programme are sponsored by ICIMOD's beekeeping project through the Rural Women's Development Unity Centre (RUWDUC, a local NGO), the intention is for ABA to develop over the coming years into a farmer-led self-financing organisation. With this intention, ICIMOD provided a revolving fund of NRs 30,000, which ABA has been using as seed money. Members of ABA also have a savings and credit scheme. They meet regularly and deposit NRs 15/month and mobilise capital among group members as loans for procuring beekeeping equipment. The project has also been facilitating them in mobilising local skills and resources. Farmers with training on hive carpentry were encouraged to construct hives and sell them in the local market. In the long term, we hope that the action research farmers and ABA will be able to run the *Apis cerana* selection programme on a sustainable basis.

Selection process

Fifty-three beekeepers with a total of 258 bee colonies were identified in three different villages of Alital VDC. Each hive was given a code number, and data are regularly generated. Beekeepers were provided with technical support for raising their bees in movable comb hives. The following criteria were adopted for selecting the best colonies of *Apis cerana*:

- honey yield;
- colony age;
- colony strength;
- brood and egg laying pattern;
- tendency of swarming and absconding; and
- resistance to diseases and parasites.

After selecting the colonies, queens are reared using artificial or semi-artificial methods of queen rearing that have already been tested and perfected on *Apis cerana*. The queens of weak, diseased, and less productive colonies will be replaced by newly reared, mated queens for better performance.

Preliminary Data on *Apis cerana* Selection

The farmers are participating regularly in generating selection data. Some preliminary data are presented below in Tables 1 and 2. However, as selection is a continuous process, the data have not yet been analysed statistically.

The preliminary data suggest that there are a few colonies that are exceptionally good (i.e., have a very low swarming tendency and good honey gathering qualities). There are a very few colonies that have not absconded or deserted their hives over an eight-year period (Table 1). Even with traditional beekeeping methods, some colonies of *Apis cerana* produce more than 5 kg of honey per harvest (Table 2). The results support the decision to start a selection and multiplication programme.

Rearing of queens from productive colonies that are well adapted to the local environment and have survived between five and eight years will surely improve the honey yield and absconding behaviour of *Apis cerana*. By choosing the best individuals and multiplying them, the gene-pool of a population grows more and more uniformly. The continuous and collective work of selection and multiplication will improve not only the yield of the colonies but also the behaviour of *Apis cerana* bees.

Honey production can be increased many times by adopting modern methods and selective breeding programmes. Wongsiri (1992) has reported that the number of colonies and

Table 1: Colony Age

Age	Percentage of colonies (n = 257)
< 1 year	67
2-4 years	27
5-7 years	5
> 8 years	1

Table 2: Honey Production

Honey harvested	Percentage of colonies (n = 198)	
	May/June	Nov/Dec
< 1 kg	8	9
1-2 kg	79	41
3-5 kg	11.5	44
> 5 kg	1.5	6

honey yield increased year by year following adoption of modern management methods and selective breeding programmes in Chonghua County, Guandong, China.

Integration of *Apis cerana* Selection and Biodiversity Conservation Programme

Plants and bees are interdependent and equally important for environmental conservation. Plants provide bees with their habitat and food requirements, and in return bees perform the critical activity of cross-pollination. It is evident that the return from honeybee pollination is several times more than the returns from honey and wax alone. Many cultivated crops or wild plants do not yield seed and fruits without pollination of their flowers. However, understanding of the importance of bee pollination is negligible in the HKH region. Therefore, by conducting training and producing awareness-raising materials, the project has been trying to change the mind set of people from beekeeping for honey production to beekeeping for increasing overall productivity and conserving biodiversity.

Conclusions

The area has a productive physical infrastructure and offers great potential for beekeeping development. Farmers are convinced of the value of the participatory action research programme on *Apis cerana* selection and are generating data regularly. However, they are still waiting for real outputs and want to have immediate benefits from the programme. Practically, it is not possible to show significant changes in colony productivity within one or two years, such changes may take five to ten years, so there is a need for long-term participation. The process of *Apis cerana* selection has just been established. Further strengthening of beekeepers' capability is essential for sustainability and continuity of the selection and multiplication programme. To promote beekeeping as a sustainable option for rural development, there is a need to link beekeeping with other development activities and biodiversity conservation programmes.

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