Chapter 69

Beekeeping in Nepal: Problems and Potentials

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In Nepal, use of honeybees ranges from honey-hunting of *Apis laboriosa* and *A. dorsata* by rural tribes who plunder honey and wax causing great damage to colonies, through traditional beekeeping with *A. cerana* practised by rural farmers, to modern beekeeping with *A. cerana* and *A. mellifera*. In remote rural areas, hollow logs and wall cavities are mostly used to hive bees. Top-bar log hives and frame hives are used by trained beekeepers who also practise simple seasonal management. Diversified vegetation and rich bee flora is abundant in the mid-hills of Nepal, so beekeeping has great potential. However, the indigenous *Apis cerana* bee is not well domesticated and beekeepers face problems of absconding, frequent queen loss, quick emergence of laying workers, high swarming tendency and small honey yields. Honey in Nepal can be classified according to bee species (*A. dorsata, A. laboriosa, A. florea, A. cerana, A. mellifera, Melipona* and *Trigona*), seasons and bee flora. However, the lack of standardisation of honey quality has created problems in reliability and popularity with consumers. Thai Sac Brood Virus and European Foul Brood are major prevalent diseases; *Vespa* spp. and pine marten are devastating predators (Anon., 1990 a, 1990 b; Baidhya *et al.*, 1997; Bhattarai, 1992). Although various agricultural and horticultural crops cultivated in Nepal require bee pollination, so far there is little use is made of honeybees for crop pollination. In contrast to *A. cerana*, traits such as higher yields of honey, and low absconding and swarming rates have made *A. mellifera* popular among innovative beekeepers. However, *Varroa* and *Vespa* problems, and higher economic investments are major constraints, and seasonal management procedures need to be developed.

In Nepal beekeeping can be useful both as an income-generating activity for rural beekeepers and as an industry for earning foreign currency. Breeding *A. cerana* with desirable traits and improving mother stocks, finding better precautions and dealing with disease and enemies, determining zonation of *A. cerana* and *A. mellifera* beekeeping, conserving bee biodiversity and honeybee flora, and utilising bees for pollination are main priorities. Increasing interest by farmers in beekeeping has put greater emphasis on solving these problems. Training of trainers and farmers (beekeepers) is essential for improving beekeeping in Nepal. The government's Bee Development Section and non-governmental organisations conduct beekeeping training programmes for leader farmers. Bee Development Section runs hive construction training for carpenters and trainers' training for technicians.

Honeybee Species: Future Potentials

At least five honeybee species exist in Nepal; four are native species—*A. florea, A. dorsata, A. laboriosa* and *A. cerana*—and *A. mellifera* is introduced. In subtropical parts of the country, *Melipona* spp. and *Trigona* spp. are also found. *Apis cerana* is kept and found naturally throughout subtemperate to subtropical regions, thus, providing tremendous genetic and technical potential for scientific research. *Apis mellifera* has been recently introduced but constraints such as heavy investment, greater susceptibility to disease and pests, and lack of resistance to natural enemies has stimulated work to improve *A. cerana* stock. Selection and breeding of *A. cerana* for desirable traits can make beekeeping with this species more viable and sustainable.

Honeybee Flora and Pollination Potentials

Diverse climatic conditions across the country provide various bee flora in tremendous quantity. Nevertheless increased deforestation and heavy use of chemicals in agriculture has resulted in the decline of both wild and domesticated bee colonies. In the Kathmandu valley, three main flows of nectar and pollen occur: the first spring flow lasts from February to early April supported by *Eucalyptus* spp., *Fraxinus floribunda, Grevillea robusta, Bauhinia purpurea, Citrus* spp., *Dyospyrus* sp., *Prunus* spp., *Pyrus* sp., *Trifolium* spp., *Abelmoschus esculentus, Brassica* spp. and *Eugenia* sp. This is followed by a short flow from April–May supported by *Zizyphus* sp., *Brassica* sp., *Solanun* sp., *Cedrela toona* and *Lonicera* sp. Then follows by a short period of dryness and so dearth before the start of the rainy season, which is also unfavorable. The third season is autumn that lasts from September to November. Main plants flowering in this period are *Prunus cerasoides, Eleucine coracana, Fagopyrum esculentum, Aesandra butyracea, Innula cappa,* and *Solidago longifolia.* Autumn is followed by a cold winter. In five districts (Kavre, Sindhuli, Nawal Parasi, Rautahat and Arghakhanchi) out of 849 farmers questioned, many (49%) replied that *Aesandra butyracea* is the major flora for honeybee especially in hilly districts, and *Nyctanthes arbortristis* is dominant in the Terai (plains) (Baidhya *et al.*, 1997). Mustard (*Brassica* spp.), litchi (*Litchi* spp.) and buckwheat (*Fagopyrum esculentum*) are also important sources (Anon., 1990 a, 1990 b). Some plants such as *Aesculus indica, Papaver* sp., *Euphorbia royleana, Lyonia ovalifolia, Maesa chisea, Pieris formosa* and *Rhododendron cinnabarinum* are suspected of yielding toxic nectar. Such honey seems to be non-toxic to bees but toxic to human beings (Kafle, 1984).

Status of Beekeeping

Apis cerana bees have a high tendency of migration and absconding creating problems for beekeepers (Baidhya *et al* 1997). The life cycle of *A. cerana* bees in Kathmandu is as follows. This scheme is approximate and may differ according to the situation and place. Life of bees is affected by bee flora availability and climate, especially rainfall and temperature (Bhattarai, 1992).

January	Winter and rest period; bees go out during daytime. Not many bee plants are flowering but incoming nectar and pollen is sufficient to keep the queen laying eggs.
February	More bee flora available, more activity by bees. Brood nest grows faster and first drone cells can be found.
March/April	Swarming season; good nectar and pollen flow. Honey production may be from 5–10 kg per hive (Baidhya *et al.*, 1997).
May/June	Gradual decrease of flow and death of drones. Absconding common (Baidhya *et al.*, 1997).
July/August	Rainy season. Bees go out between showers and even store honey. Brood nest remains constant.
September	Increased activity; building of drone cells.
October	Swarming season but less than in March. Change of queens without swarming is also possible (supersedure). Good nectar flow.
November	Eviction/slaughtering of drones.
December	Winter and rest period. Bees fly during daytime. Brood rest remains small, but egg-laying continues at a minimum.

Most of beekeepers do not have the opportunity to be trained. Over ninety per cent of farmers interviewed were untrained but interested in attending training programmes. Main sources of training for farmers are governmental (Bee Development Section, Godwari), non-governmental organisations, and farmers' traditions and own experience (Anon., 1990a, 1990b; Baidhya *et al.*, 1997). Women are equally interested in beekeeping training programmes.

Problems and Potentials

Domesticated bees as well as wild bees such as *A. dorsata* and *A. laboriosa* are facing worse environmental conditions and are in need of conservation. The number of wild colonies is declining in Nepal. Main causes of colony decline include the following.

Deforestation

In Nepal deforestation is causing the loss of flowering plants, bee flora and natural vegetation. This leads from highly diverse natural ecosystems to far less diverse (often monocultures) agro-ecosystems. The scarcity of bee pasture due to deforestation not only leads to decline in colony numbers but also creates 'stress condition' for living bee colonies and increases their vulnerability to pests and diseases, and hunting (Verma, 1993).

Honey-hunting and human predation

In Nepal traditional honey-hunting is carried out by certain communities to earn a livelihood. It results in the destruction of bee colonies and also the development of undesirable traits such as absconding or swarming. Since many of these absconding or swarming colonies have the propensity to return to the same nesting site each year, they are subjected to repeated harmful destruction (Bishop, 1992). If honey-hunters are trained to keep bees properly or harvest honey without damaging colonies, or given alternative means of earning livelihood through training programmes, the degree of damage caused by honey-hunting can be diminished.

Diseases and enemies

Thai Sac Brood Virus Disease killed 90–95% of *A. cerana* colonies in Nepal between 1980 and 1984. Around 5 % seemed to be resistant and the number of colonies has increased since then (Crane, 1992; Rana *et al.*, 1986, 1987; Verma, 1993). Recently European Foul Brood has badly affected *A. cerana* colonies in the Kathmandu Valley (Verma, 1993). The mites, *Acarapis woodi, Varroa jacobsoni, Neocypholaelaps, Tropilaelaps* sp. and *Pyemotes naferi* have been reported on *A. cerana*. Acarine disease poses a serious problem (Verma, 1987). Wasps (especially *Vespa* spp.) and hornets are serious predators of *A. cerana* although, because of its evasive shivering and shimmering behaviour, it can resist attack by wasps better than *A. mellifera*. Two species of wax moth, *Galleria mellonella* and *Achroia grisella*, are serious pests of *A. cerana* as this species does not collect propolis to guard against attack by moths.

Pesticide damage

In developing countries such as Nepal, honeybees face high risk of pesticide application, often through farmer ignorance. Unlike in developed countries, as well as limited know-how there is also lack of legislation to regulate the use of pesticides. Integrated pest management technologies are not prevalent. They could protect bees from the harmful effects of broad-spectrum biocides. Major pesticides used are Metacid, Nuvan and Thiodan/Decis (Baidhya *et al.*, 1997).

Impact of exotic *Apis mellifera*

Despite the higher initial investment and problems of local pests and diseases, the importation and propagation of exotic *A. mellifera*, for better economic returns in terms of higher honey production and efficient pollination services, is constantly increasing and replacing *A. cerana* beekeeping in Nepal. The two species

frequently rob each other (Verma, 1993), and when kept together intermating produced lethal offspring that caused failure of their coexistence (Verma, 1993). The transfer of parasites and diseases from one species to another is another problem: *Varroa jacobsoni* can coexist with and cause no serious harm to *A. cerana*, but proves a serious pest to *A. mellifera* that conversely can transfer new diseases to *A. cerana*.

Apis cerana bees used in Nepal are still wild in nature and need a great deal of attention for stock improvement. The greater tendency of absconding and swarming, fighting and robbing, frequent queenlessness, quick emergence of worker layers, susceptible to stress and low honey yields are the main drawbacks (Anon., 1990 a, 1990b; Baidhya *et al.*, 1997). Colonies of *A. cerana* in Nepal are highly susceptible to threats by natural enemies and environmental degradation or adverse conditions. Stock improvement to select races for reduced absconding behaviour is a priority. Furthermore, should such selection be attempted, a queen-breeding station for large-scale distribution of queens would be required.

The lack of appropriate technology for indigenous *A. cerana* as well as skilled technicians needs attention. Apart from abundant natural resources suitable for honey production in Nepal, honeybees can also be exploited for pollination of agricultural crops (Kevan, 1993). Pollination programmes can be united with crop, fruit and seed production programmes. The transfer of technology to farmers is only assured through practical training programmes that in turn require training infrastructures and manpower development. To cope with supply-and-demand problems of beekeeping equipment and implements, apiary resource centres have been developed in parts of Nepal. These centres are useful for helping to solve technical problems and for carrying out laboratory work. They can also be used as gene pools for selection and breeding of colonies with desirable traits. They provide training and extension to farmers and trainers enhancing local participation.

Policy Guidelines

In Nepal there is lack of legislation regarding bees, bee equipment and honey, and it is difficult to enforce existing legislation. For conservation of bees, discouraging honey-hunting, the heavy use of chemical sprays, and deforestation are the main areas to be taken into account. Legislation regarding importation of bees or beekeeping equipment, honey or hazardous chemicals must be developed and adopted. Beekeeping zones should be specified to avoid competition and/or problem transmission between *A. mellifera* and *A. cerana*. Standardisation of honey and legislation to discourage honey adulteration should be strictly followed (Crane, 1992).

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