CHAPTER 5

Status and Economics of Beekeeping in the Hindu Kush-Himalayan Countries

5.1 INTRODUCTION

Beekeeping in the developing countries of the Hindu Kush-Himalayan region is still an old traditional household activity. It is only in recent years that this enterprise is becoming commercially organized in parts of China, India and Pakistan as a result of the introduction of the high honey-yielding species of *Apis mellifera*. In other parts, it is mostly small and marginal farmers who keep one to five colonies of *Apis cerana* in different types of traditional hives and even today, honey is extracted by the "squeezing method" without any quality control standards. One of the reason for such a deploring scenario is that direct and indirect economic gains/benefits of this important enterprise have not been projected properly. Economists are generally criticised for not taking ecology seriously, similarly beekeeping has been overlooked by them. So far no systematic studies on the economics of beekeeping has been carried out to project the immense importance of this enterprise.

In the this Chapter, the economics of beekeeping based on the data supplied by different bee scientists of the region have been worked out. Such an analysis provides broad guidelines to initiate action to develop beekeeping as an enterprise for different target groups at various technological levels.

For example, the present analyses include the comparative economics of beekeeping with native *Apis cerana* versus *Apis mellifera* in Himachal Pradesh; modern movable frame "Newton hive" versus traditional beekeeping with *Apis cerana* in Bangladesh and Nepal; standard Langstroth hive beekeeping versus low cost hive beekeeping; and

small-scale versus commercial-scale beekeeping with *Apis mellifera* in Pakistan.

For each country/region, firstly the present status of beekeeping is reviewed and this is followed by economic analyses made on the following lines:

1) Cost and returns per colony.

2) Cash flow projections assuming that a farmer starts with two colonies in the first year and increases subsequently to 10 colonies in the fifth year at the rate of two colonies per year and then keep this number constant.

3) Sensitivity analysis, by reducing the returns by 50 per cent and maintaining the cost at the same level.

5.2 HIMACHAL PRADESH (NORTHERN INDIA)

Keeping in view the varied socio-economic and ecological conditions of a vast country like India, only the case study of Himachal Pradesh on economics of beekeeping has been chosen. Modern beekeeping in India has its origin in Himachal Pradesh, where this cottage industry is a source of food and income to the people. All the four species of honeybees are found in different climatic zones of Himachal Pradesh. Within the past two decades, the sub-tropical and sub-temperate zones in the state have successfully developed beekeeping programmes with exotic *Apis mellifera*, while in the temperate zone, beekeeping with *Apis cerana* has progressed well through the centuries by improvement in management techniques. At present, both *Apis cerana* and *Apis mellifera* are complementary to each other as far as beekeeping in the temperate and sub-tropical regions, respectively, of the state are concerned.

Apis cerana is kept either in wall (fixed type) hives or movable hollowed out logs, wooden boxes, mud receptacles or earthen pitchers. At some places very crude and indigenous methods are still in use for the collection and extraction of honey from such traditional hives. However, the introduction of modern bee management techniques has changed all this. The modern hive used for beekeeping with *Apis cerana* in Himachal Pradesh are movable wooden frame hives (called villager's hive) adapted to the size of *Apis cerana*, whereas *Apis mellifera* is kept in standard Langstroth hives. Modern beekeeping equipment for extraction and processing of honey is supplied by different government agencies and private firms. In Himachal Pradesh, the annual production of honey is more than 150 tonnes. Recently, the State Horticultural Produce, Marketing and Processing Corporation, Ltd. (HPMC) has taken over the marketing of surplus honey in the state. This organization purchases bulk honey from the beekeepers and is responsible

for its processing, packing and grading. At present, the state produces only about 30 quintals of beeswax which is mainly used for the preparation of comb foundation sheets.

Himachal Pradesh is a leading state in India and southeast Asia where the management and renting of *Apis cerana* and *Apis mellifera* colonies is being done in a scientific way for the pollination of apple orchards. Thus, beekeeping forms an integral part of horticultural management technology in the state (Verma, 1984).

Although there is a great variety of pollen and nectar-yielding plants in Himachal Pradesh, they are mostly multifloral sources of honey. *Plectranthus* sp., is one of the few honey plants of northern India which acts as a unifloral source of honey. Besides the harmful effects of biocides on honeybees in the state, recently (1983–1988) a sacbrood virus disease killed more than 95 per cent of the colonies of *Apis cerana* in northern India. However, this loss has been duly compensated by starting beekeeping with *Apis mellifera* on a large scale in the state. Moreover, sacbrood virus disease has completed its four-year cycle in Himachal Pradesh and all the districts are now disease-free (Verma, 1989b).

The estimation of costs and returns for *Apis cerana* and *Apis mellifera* are based on the information collected from a sample of 50 growers who are engaged in honey production, as well as from the State Horticulture Department which is maintaining bee colonies at 43 different beekeeping stations in Himachal Pradesh. The survey was conducted in 1987. Hence estimation of costs is based on 1987 prices (Verma, 1989b).

The costs and returns per colony of *Apis cerana* and *Apis mellifera* are given in Tables 5.1 and 5.2, respectively. It may be observed from the tables that the annual cost for the installation and operation of one colony of *Apis cerana* and *Apis mellifera* has been estimated at Indian rupees 123 and 317 comprising Rs.90 and Rs.240 as recurring and Rs.32 and Rs.77 as non-recurring costs, respectively. Direct payments to labour are not involved, so while estimating net returns, "Opportunity cost" of labour has not been taken into account. Thus, a bee colony generates net profit of Rs.369 per year in the case of *Apis cerana* and Rs.920.80 for *Apis mellifera*. These results show that beekeeping with *Apis mellifera* is more beneficial than *Apis cerana*.

The cash flow projections of honey and beeswax production are given in Table 5.3 for *Apis cerana* and Table 5.4 for *Apis mellifera*. It may be observed from these tables that during the first year of operation the entrepreneur will incur a loss of Rs.216 in beekeeping with *Apis cerana* and Rs.27 with *Apis mellifera*. Subsequently, the profit he will derive during a period of one decade has been estimated at over Rs.29,000 and Rs.78,900 for *Apis cerana* and *Apis mellifera*,

Table 5.1: Costs and returns of a beekeeping enterprise with the Indian hive bee *Apis cerana* in Himachal Pradesh, India, 1987

	Item	Price (Rs.)	Life years	Cost/year (Rs.)*
I.	COSTS			
A.	*Fixed costs:*			
	Bees	25.00	10	2.50
	Bees veil	25.00	3	0.75
	Hive tool	15.00	10	0.15
	Smoker	30.00	5	0.60
	Honey extractor	300.00	5	6.00
	Uncapping tray and knife	250.00	5	5.00
	Village hive	150.00	10	15.00
	Hive stand	25.00	10	2.50
	Sub-total	820.00	—	32.50
B.	*Variable costs:*			
	Comb foundation sheet	40.00	1	40.00
	Hessian cloth	8.00	1	8.00
	Sugar (5 kg @ Rs.8/per kg)	40.00	1	40.00
	Acaricide and other drugs	2.00	1	2.00
	Sub-total:	90.00	—	90.00
	Total costs (A+B)	910.00	—	122.50
II.	RETURNS			
	Honey (8 kg @ Rs.60/per kg)			480.00
	Beeswax (0.15 kg @ Rs.75/per kg)			11.25
	Total returns			491.25
III.	NET RETURNS (II–I)			368.75

Source: Verma, 1989b.

*One U.S. Dollar = 17 Indian Rupees.

respectively. The loss incurred in the first year will be recouped in the following year of operation with both the species. Even after recouping these losses there will be a profit of Rs.993 and Rs.3,163 for *Apis cerana* and *Apis mellifera*, respectively. The State Government is providing subsidy on the purchase of bees, villager's hive, hive stands,

Table 5.2: Costs and returns in honey production in beekeeping with European honeybee *Apis mellifera* in Himachal Pradesh, 1987

(per hive)

	Items	Cost (Rs.)	Life (years)	Cost/year/ colony (Rs.)
I.	COSTS			
A.	*Fixed cost:*			
	Bees	200.00	10	20.00
	Bee veil	25.00	3	0.75
	Hive tool	15.00	10	0.15
	Smoker	30.00	5	0.60
	Honey extractor	750.00	5	15.00
	Uncapping tray/knife	250.00	5	5.00
	Hive	327.00	10	32.70
	Hive stand	25.00	10	2.50
	Sub-total:	1622.00	—	76.70
B.	*Variable cost:*			
	Comb foundation sheet	150.00	1	150.00
	Hessian cloth	8.00	1	8.00
	Sugar (10 kg 8/- per kg)	80.00	1	80.00
	Acaricide and other drugs	2.00	1	2.00
	Sub-total:	240.00	—	240.00
	Total cost (A+B)	1862.00	—	316.70
II.	RETURNS			
	Honey (20 kg per hive @ Rs.60/ kg)	1200.00	—	1200.00
	Beeswax (0.5 kg @ Rs.75/kg)	37.50	—	37.50
	Total returns:	1237.50	—	1237.50
III.	NET RETURNS (II–I)	–624.50	—	920.80

Source: Verma, 1989b.

Table 5.3: Cash flow projection of beekeeping enterprise with Indian honeybee *Apis cerana* in Himachal Pradesh, India, 1987

Item	Years									
	1	2	3	4	5	6	7	8	9	10
A. CASH OUTFLOWS										
i) Bees*	50	50	50	—	—	—	—	—	—	—
ii) Villager's hive**	300	300	300	300	300	—	—	—	—	—
iii) Hive stand	50	50	50	50	50	—	—	—	—	—
iv) Bee veil	25	—	—	25	—	—	25	—	—	25
v) Hive tool	15	—	—	—	—	—	—	—	—	—
vi) Smoker	30	—	—	—	—	30	—	—	—	—
vii) Honey extractor	300	—	—	—	—	300	—	—	—	—
viii) Uncapping tray and knife	250	—	—	—	—	250	—	—	—	—
ix) Comb foundation sheet	80	160	240	320	400	400	400	400	400	400
x) Sugar (10 kg @ Rs.8/- per kg)	80	160	240	320	400	400	400	400	400	400
xi) Hessian cloth	16	32	48	64	80	80	80	80	80	80
xii) Acaricide	2	4	6	8	10	10	10	10	10	10
Total:	1198	756	934	1087	1240	1470	915	890	890	915

B. CASH INFLOWS										
i) Honey (8 kg per hive @ Rs.60/per kg)	960	1920	2880	3840	4800	4800	4800	4800	4800	4800
ii) Bees wax (0.30 kg @ Rs.75/- per kg)	22	45	68	90	113	113	113	113	113	113
Total:	982	1965	2948	3930	4913	4913	4913	4913	4913	4913
C. Net cash flow (B–A)	–216	1209	2014	2843	3673	3443	3998	4023	4023	3998
D. Cumulative cash flow	–216	993	3007	5850	9523	12966	16964	20987	25010	29008

* Two bee hives to be added up to three years and then those multiply on their own.

* 10 hives per household is an ideal size and these be raised over five years by increasing two hives each year.

Note: All costs and returns are calculated at constant price and constant honey yield per colony.
For details see Table 5.1.

Table 5.4: Ten years cash flow projection of honey production from European honeybee *Apis mellifera* in Himachal Pradesh, 1987

Item	Years									
	1	2	3	4	5	6	7	8	9	10
A. CASH OUTFLOWS										
i) Bees	400	400	400	—	—	—	—	—	—	—
ii) Langstroth hive	654	654	654	654	654	—	—	—	—	—
iii) Hive stand	50	50	50	50	50	—	—	—	—	—
iv) Bee veil	25	—	—	25	—	—	25	—	—	25
v) Hive tool	15	—	—	—	—	—	—	—	—	—
vi) Smoker	30	—	—	—	—	30	—	—	—	—
vii) Honey extractor	750	—	—	—	—	750	—	—	—	—
viii) Uncapping tray and knife	250	—	—	—	—	250	—	—	—	—
ix) Comb foundation sheet	150	300	450	600	750	750	750	750	750	750
x) Sugar (10 kg @ Rs.8/- per kg)	160	320	480	640	800	800	800	800	800	800
xi) Hessian cloth	16	32	48	64	80	80	80	80	80	80
xii) Acaricide	2	4	6	8	10	10	10	10	10	10
Total	2502	1760	2088	2041	2344	2670	1665	1640	1640	1665

B. CASH INFLOWS										
i) Honey (20 kg/colony @ Rs.60/per kg)	2400	4800	7200	9600	12000	12000	12000	12000	12000	12000
ii) Bees wax (0.5 kg) (1 kg per two colonies Rs.75/- per kg)	75	150	225	300	375	375	375	375	375	375
Total:	2475	4950	7425	9900	12375	12375	12375	12375	12375	12375
C. Net cash flow (II–I)	–27	3190	5337	7859	10031	9705	10710	10735	10735	10710
D. Cumulative cash flow	–27	3163	8500	16359	26390	36095	46805	57540	68275	78985

Note: The cash inflows and outflows are calculated at constant price and constant honey yield per colony. For details see Table 5.2.

etc. @ to 50 per cent to Scheduled Castes, Scheduled Tribes, Backward Classes and farmers covered under the Integrated Rural Development Programme. After taking into account the subsidy element, the cash flow would further improve. Similarly, subsidies at lower rates, i.e. 25 and 33 per cent, respectively are also provided by the government to small and marginal farmers.

Sensitivity analysis has been undertaken by reducing the returns by 50 per cent and maintaining the cost at the same level. The details regarding cost and returns for *Apis cerana* are given in Table 5.5 and *Apis mellifera* Table 5.6. It may be seen from Table 5.5 that by reducing the income by 50 per cent, the activity will incur a loss during first year of operation which will be recouped in the subsequent two years of operation which will be recouped in the subsequent two years of operation in the case of beekeeping with *Apis cerana*. In the case of *Apis mellifera*. However, after reducing the income by 50 per cent, the activity still generates a profit as the loss incurred in the first year of operation is recovered in the subsequent two years of beekeeping. Beekeeping with *Apis cerana* will generate profits from the third to the tenth year.

Table 5.5: Costs and returns of honey production in Himachal Pradesh, for beekeeping with *Apis cerana*

Sensitivity Analysis

Years	Total[1] costs	Total[2] returns	Total returns	Net[3] returns
1	1198	982	−216	−707
2	756	1965	1209	227
3	934	2948	2014	540
4	1087	3930	2843	878
5	1240	4913	3673	1217
6	1470	4913	3443	987
7	915	4913	3998	1542
8	890	4913	4023	1567
9	890	4913	4023	1567
10	915	4913	3998	1542

1. Includes both fixed and variable costs. For details see Tables 5.1 and 5.3
2. For details see Tables 5.1 and 5.3
3. A shortfall of 50 per cent assumed in the total returns.

Table 5.6: Costs and returns of honey and beeswax production in Himachal Pradesh for beekeeping with *Apis mellifera*
Sensitivity Analysis

Years	Total[1] Costs	Total[2] returns	Total returns	Net[3] returns
1	2502	2475	−27	−1264.5
2	1760	4950	3190	715
3	2088	7425	5337	1624.5
4	2041	9900	7859	2909
5	2344	12375	10031	3843.5
6	2670	12375	9705	3517.5
7	1665	12375	10710	4522.5
8	1640	12375	10735	4547.5
9	1640	12375	10735	4547.5
10	1665	12375	10710	4522.5

1. Includes both fixed and variable costs. For details see Tables 5.2 and 5.4
2. For details see Tables 5.2 and 5.4
3. A shortfall of 50 per cent assumed in total returns.

5.3 NEPAL

The rural people of Nepal have exploited honeybees for honey since time immemorial, and beekeeping is traditionally linked with crop farming and animal husbandry. Beekeeping with *Apis cerana*, in Nepal, is still a traditional household activity and accounts for an average honey yield of 5 to 6 kg per colony per year. However, some progressive beekeepers can obtain higher honey yields of 25 kg per colony from the native hive bee, *Apis cerana*. Other species of wild honeybees, *Apis dorsata/laboriosa* and *Apis florea*, are eratic honey yielders and have provided honey to the people living near the forest areas.

When the Terai and inner Terai were densely forested, *Apis dorsata* honey was a big source of forest revenue. Even today, forest dwellers hunt for its honey and sell it in the nearby rural markets. A professional hunter manages to collect up to 30 kg of honey per colony per year.

Two distinct races of the native, *Apis cerana*, i.e., yellow and dark ones, are found in Nepal. This species is kept and managed traditionally around human settlements, and honey is drawn by squeezing the combs. Attempts to introduce a few colonies of the European honeybee, *Apis mellifera*, have not been successful so far. Traditionally, *Apis cer-*

ana is kept in *Khope* hives (wall hives) or in mud hives. Attempts have also been made, through a UNICEF project, to introduce the popular Kenyan top bar hive for beekeeping with *Apis cerana* but with little success. Different types of movable frame hives modified from Newton B models of Indian make are now in common use (Kafle, 1990). Many of the modern hives in use are of poor quality and highly priced (Ham, 1990).

Various cultivated as well as wild plants provide mixed types of bee forage which vary in different agro-climatic belts of the country. In the Kathmandu valley alone, 180 plant species have been identified as pollen and nectar sources. Migratory beekeeping between the Terai and the mountain areas of the Kingdom can yield good results. Sacbrood virus disease killed more than 90 per cent of the colonies of *Apis cerana* in Nepal in 1983. However, this disease had a four-year cycle and since then the normal population of this native hive bee has been getting restored.

In Nepal, honey is in great demand and the price is about US$ 7 per kg. For the establishment of beekeeping on sound, scientific lines, there is a need to distribute properly designed bee hives to beginners, initiate training programmes and adopt management practices appropriate to beekeeping with native *Apis cerana*. In the past, many projects on beekeeping development were undertaken with varying success. The biggest one at present is the Beekeeping Training and Extension Support Project (BETRESP) being run by the Ministry of Agriculture, Nepal, in cooperation with Netherlands Development Organization (SNV-Nepal). The total cost of the project is US$ 862,100. This project is being run in 10 selected districts of the Kingdom. Under this programme, about 1,700 modern bee hives have been distributed to the farmers and honey production in the project area has been estimated as 28 MT. In the next five year plan, government of Nepal plans to distribute 4,000 additional bee hives of *Apis cerana* and raise honey production to 40 MT in project area. (K.K. Shrestha, personal communication).

The estimation of costs and returns from beekeeping with *Apis cerana* in Nepal are based on the information provided by Himalayan Bee Concern, a private beekeeping enterprise, and the HMG and SNV Beekeeping Training and Extension Support Project. These estimates are based on 1988 prices (Rathore and Verma, 1990). The annual installation and operational cost of one colony of *Apis cerana* kept in a movable frame Indian "Newton type hive" is 655 NER (Nepalese rupees) out of which Rs.430 is fixed cost and 225 is variable cost. An *Apis cerana* colony generates a net profit of Rs.1,795 in the first year of its operation (Table 5.7). Cash flow projections for estimates indicate that the enterprise will make a profit even during the first year

Table 5.7: Economics of beekeeping with Asian hive bee *Apis cerana* in Nepal, 1988

	Items	Cost (Rs.)	Life (years)	Cost/year/* colony (Rs.)
I.	COSTS			
A.	*Fixed cost:*			
	Bees	500.00	10	50.00
	Bee veil	75.00	3	25.00
	Hive tool	50.00	10	5.00
	Smoker	50.00	5	10.00
	Honey extractor	1000.00	5	200.00
	Uncapping tray/ knife	200.00	5	40.00
	Village hive	1000.00	10	100.00
	Sub-total:	2875.00	—	430.70
B.	*Variable cost:*			
	Comb foundation sheet	150.00	1	150.00
	Hessian cloth	10.00	1	10.00
	Sugar (6 kg 10/- per kg.)	60.00	1	60.00
	Acaricide and other drugs	5.00	1	5.00
	Sub-total:	225.00	—	225.00
	Total cost (A+ B)	3100.00	—	655.70
II.	RETURNS			
	Honey (8 kg @ Rs.300/kg)	—	—	2400.00
	Beeswax (0.5 kg @ Rs.100/kg)	—	—	50.00
	Gross income:	—	—	2450.00
III.	NET RETURNS (II–I) (Gross Income – Total Cost)	—	—	1795.00

Source: Himal Bee Concern, Kirtipur, Kathmandu.

* One U. S. Dollar = 29 Nepalese Rupees.

Table 5.8: Ten years cash flow projection for beekeeping enterprise with Asian hive bee *Apis cerana* in Nepal, 1988

Item	Years									
	1	2	3	4	5	6	7	8	9	10
A. CASH OUTFLOWS										
i) Bees	1000	1000	—	—	—	—	—	—	—	—
ii) Villager's hive	2000	2000	2000	2000	2000	—	—	—	—	—
iii) Bee veil	75	—	—	75	—	—	75	—	—	75
iv) Hive tool	50	—	—	—	—	—	—	—	—	—
v) Smoker	50	—	—	—	—	50	—	—	—	—
vi) Honey extractor	1000	—	—	—	—	1000	—	—	—	—
vii) Uncapping tray/knife	200	—	—	—	—	200	—	—	—	—
viii) Comb foundation sheet	300	600	900	1200	1500	1500	1500	1500	1500	1500
ix) Sugar	120	240	360	480	600	600	600	600	600	600
x) Hessian cloth	20	40	60	80	100	100	100	100	100	
xi) Acaricide	10	20	30	40	50	50	50	50	50	50
Total:	**4825**	**3900**	**3350**	**3875**	**4250**	**3500**	**2325**	**2250**	**2250**	**2325**

B. CASH INFLOWS										
i) Honey (8 kg/ colony @ Rs.300/ per kg)	4800	9600	14400	19200	24000	24000	24000	24000	24000	24000
ii) Bees wax (0.5 kg) at the rate of Rs.100/kg	50	100	150	200	250	250	250	250	250	250
Total:	4850	9700	14550	19400	24250	24250	24250	24250	24250	24250
C. NET CASH FLOW (B—A)	25	5800	11200	15525	20000	20750	21925	22000	22000	21925
D. Cumulative cash flow	25	5825	17025	32550	52550	73300	95225	117225	139225	161150

Note: All costs and returns are calculated at constant price and constant yield per colony.
For details see Table 5.7.

of operation, and that the accumulative profit during a period of one decade would be over 1,61,150 NER (Table 5.8). Sensitivity analysis results suggest that the activity would a incur a loss only during the first year of operation (Table 5.9).

5.4 BANGLADESH

There are at present three species of honeybees in Bangladesh: *Apis dorsata*, *Apis cerana* and *Apis florea*. The Sunderban forests are the major natural habitat of *Apis dorsata* and the annual honey yield per colony may by up to 50 kg. *Apis dorsata* is found in other parts of the country also. The little or dwarf bee, *Apis florea*, yields only 1–3 kg of honey per annum but is of great economic value as pollinator of agricultural crops.

Apis cerana, the domesticated hive bee is native to Bangladesh and is akin in its biometric characters and body size, to *Apis cerana indica* found in southern India (Svensson, 1988). The average honey yield from *Apis cerana* varies from 4 to 10 kg per colony but there are reports that maximum yields up to 20 kg can be harvested. Such variations in yield offer great potential for the improvement of this native bee species through selective breeding and appropriate management technology (Dewan, 1987).

There are at present about 8,000 part-time and full-time beekeepers in Bangladesh maintaining about 10,000 *Apis cerana* colonies. In potential beekeeping areas, it is possible to keep as many as 10 colonies per square kilometre (Kevan, 1983). Beeswax is generally not harvested. All honey extraction is done by a small hand-turned extractor manufactured by the Bangladesh Institute of Apiculture (BIA). Honey quality in Bangladesh is generally very poor because of its high moisture content (25 to 40 per cent). However, there is a considerable possibility to reduce such a high moisture content by harvesting fully ripened honey in a scientific way. Beekeeping equipment and supplies and technical know-how is available through Bangladesh Small and Cottage Industries Corporation (BSCIC) and other national and international agencies such as Canadian University Service Overseas (CUSO), Bangladesh Institute of Apiculture (BIA) and Proshika Mano Unnayan Kendra (PROSHIKA) also.

Apart from many pests and predators, important bee diseases are Thai sacbrood, varroa mite and European foul brood. Frequent swarming, absconding, robbing and lack of facilities for mass queen rearing are other problems in beekeeping with *Apis cerana* in Bangladesh (Nash and Murell, 1981).

In Bangladesh, the vegetation is diverse and well-suited for bee forage. Most of the good pollen and nectar sources are litchi, jack fruit,

lemon, *Acacia, Albizia*, coconut, drumstick, black berry, mango, *Eucalyptus*, Papaya, guava, etc. A variety of weeds such as Senecio, Bhait, brangals, *Leucus lavendifolia* are used by bees for pollen and nectar.

According to Svenssen (1988), a new design of beekeeping technology and a new management system based on the socio-economic and ecological conditions of Bangladesh, promise more hope for the several of poor and landless people in the country.

In Bangladesh, the economics of beekeeping with a low-cost traditional bar hive (TBH) and a movable frame Indian "Newton hive" have been compared. The estimation of the costs and returns for a traditional top bar hive is based on the data provided by Svensson (1988) and cost and return estimates for beekeeping by using a modern "Newton hive" by Mohamed (1984) and FAO report (1986). The costs and returns per colony of *Apis cerana* kept in "traditional top bar hives" and "Newton hives" are given in Tables 5.10 and 5.11, respectively.

These results reveal that the annual cost for the installation and operation of one top bar traditional hive and Newton hive has been estimated as Takka 110 and 282, respectively. An *Apis cerana* colony generates a net profit of Takka 370 per year from the top bar hives and Takka 483 from the Newton hives. The estimation of cash flow projections of honey and beeswax production during the first year of operation, there is a profit of Takka 760 by using top bar hives and a loss of Takka 1,216 with Newton hives. Subsequently, there will be profits made from both designs. The accumulated cash flow during the period of one decade has been estimated at over 34,040 and 42,069 Takka by using top bar hives and Newton hives, respectively. The loss incurred in the first year will be recouped in the following two years of operation with a profit of Rs.2,439 with Newton hives. With the traditional bark hive, there is a profit of Rs.760 even during the first year of operation (Tables 5.12. and 5.13).

Details of a sensitivity analysis have been given in Tables 5.14 and 5.15. By reducing the income by 50 per cent, the activity will incur a loss during the first two years with the use of Newton hives. In the case of the top bar hive, their is no loss.

5.5 PAKISTAN

Beekeeping is practised on a small scale, throughout Pakistan, except in the desert areas. Apart from a few progressive beekeepers who are familiar with modern technology, traditional methods of beekeeping are widely used. Therefore, in comparison to the developed countries, honey yield per colony is quite low.

Honey bee and insect pollinator populations in Pakistan are among the lowest in the world. As a result of this, yields of certain fruits,

Table 5.9: Costs and returns of honey and beeswax production in Nepal for beekeeping with *Apis cerana*

Sensitivity Analysis

Years	Total[1] costs	Total[2] returns	Total returns	Net[3] returns
1	4825	4850	25	−2400
2	3900	9700	5800	950
3	3350	14550	11200	3925
4	3875	19400	15525	5825
5	4250	24250	20000	7875
6	3500	24250	20750	8625
7	2325	24250	21925	9800
8	2250	24250	22000	9875
9	2250	24250	22000	9875
10	2325	24250	21925	9800

1. Includes both fixed and variable costs. For details see Tables 5.7 and 5.8
2. For details see Tables 5.7 and 5.8
3. A shortfall of 50 per cent assumed in total returns.

Table 5.10: Economics of beekeeping in Bangladesh* by using traditional top bar hive, 1988

	Items		Amount (Taka) per Colony (Taka 33 = US$ 1) 1988
I.	*EXPENDITURE*		
	Bee box		20.00
	Bees		20.00
	Extractor/Filter cloth		20.00
	Sugar		50.00
		Total Cost (T):	*110.00*
II.	*INCOME*		
	Honey		400.00
	Bees wax		80.00
		Total Income (T):	*480.00*
III.	*NET RETURN* per colony (II−I) = 480−110 =		370.00 T

* Table drawn from Borje Svensson, 1988. "Beekeeping Technology in Bangladesh—A Description of Past and Present Situation with Suggested Modifications", pp. 31–32.

Table 5.11: Beekeeping with *Apis cerana* in Bangladesh by using modern Newton hive, 1986

	Items	Price (TK.)	Life (Years)	Cost/year/ Colony (TK.)
I.	COSTS			
A.	*Fixed cost:*			
	Bees	100.00	10	10.00
	Bee box	350.00	10	35.00
	Queen gate	20.00	2	10.00
	Queen excluder	150.00	5	30.00
	Veil	150.00	3	5.00
	Knife	20.00	2	2.00
	Honey extractor	1000.00	5	20.00
	Foundation	15.00	1	15.00
	Contingencies	77.00	1	77.00
	Labour	78.00	1	78.00
A.	Total cost:	1960.00	—	282.00
B.	RETURNS			
	Items	Value (TK/kg)	Amount (kg)	Return/year/ (TK.)
	Honey	50.00	15	750.00
	Bees wax	60.00	0.25	15.00
	Total returns:	110.00	—	765.00
	Net return per colony (A–B)	1850.00	—	483.00

Source: FAO Agricultural Services Bulletin No. 68, 1986.

vegetables, fodders, and oilseed crops are adversely affected. All four species of the genus *Apis* are found in Pakistan. There are at present 14,000 colonies of the European bee, *Apis mellifera*, maintained in modern hives by progressive beekeepers. The number of native, *Apis cerana* and *Apis dorsata* colonies, may be between 40,000 to 55,000 and 65,000 to 75,000, respectively. *Apis cerana* colonies are usually kept in traditional hives. The major honey plants are cultivated crops and forest vegetation. Among them, *Brassica* spp., *Helianthus* spp., *Medicago* spp., *Panicum.*, spp., *Sorghum* spp., *Acacia* spp., *Albizia* spp., *Fraxinus* spp., *Eucalyptus* spp., *Plectranthus* spp., and *Dalbergia* spp., are the most important honey resources. At present, the bee flora in Pakistan can support 0.5 to 0.6 million colonies and produce 8,000–10,000 MT

Table 5.12: Ten years **cash flow projection** of honey production from Asian honeybee *Apis cerana* in Bangladesh using traditional top bar hive

	Item	Years									
		1	2	3	4	5	6	7	8	9	10
A.	CASH OUTFLOWS										
i)	Bees	40	40	40	—	—	—	—	—	—	—
ii)	Villager's hive	40	40	40	40	40	—	—	—	—	—
iii)	Honey extractor/ filter cloth	20	—	—	—	—	20	—	—	—	—
iv)	Comb foundation sheet										
v)	Sugar	100	200	300	400	500	500	500	500	500	500
vi)	Hessian cloth										
vii)	Acaricide										
A.	Total:	200	280	380	440	540	520	500	500	500	500

B.	CASH INFLOWS									
i)	Honey (8 kg/ colony @ TK.50/ per kg)	-800	1600	2400	3200	4000	4000	4000	4000	4000	4000
ii)	Bees wax (0.5 kg) (1 kg per two colonies TK.75/- per kg)	160	320	480	640	800	800	800	800	800	800
	Total:	960	1920	2880	3840	4800	4800	4800	4800	4800	4800
C.	NET CASH FLOW (B–A)	760	1640	2500	3400	4260	4280	4300	4300	4300	4300
	Cumulative cash flow	760	2400	4900	8300	12560	16840	21140	25440	29740	34040

Note: All costs and returns are calculated at constant price and constant yield per colony.
For details see Table 5.10.

Table 5.13: Ten years cash flow projection of production from *Apis cerana* Bangladesh by using Newton hive, 1986

	Item	Years									
		1	2	3	4	5	6	7	8	9	10
A.	CASH OUT FLOWS										
i)	Bees	200	200	200	—	—	—	—	—	—	—
ii)	Bee box	700	700	700	700	700	—	—	—	—	—
iii)	Queen excluder	300	300	300	300	300	300	300	300	300	300
iv)	Knife	20	20	20	20	20	20	20	20	20	20
v)	Queen gate	40	40	80	80	120	80	120	80	120	80
vi)	Veil	150	—	—	150	—	—	150	—	—	150
vii)	Honey extractor	1000	—	—	—	—	1000	—	—	—	—
viii)	Comb foundation sheet	30	60	90	120	150	150	150	150	150	150
ix)	Contingencies	306	551	734	857	918	765	765	765	765	765
	Total:	−2746	−1871	−2124	+2227	+2208	+2315	+1505	+1315	+1355	+1465

B.	CASH INFLOWS										
i)	Honey (15 kg/ colony @ TK.50/ per kg)	1500	3000	4500	6000	7500	7500	7500	7500	7500	7500
ii)	Bees wax (0.5 kg) (1 kg per two colonies TK.75/- per kg)	30	60	90	120	150	150	150	150	150	150
	Total:	1530	3060	4590	6120	7650	7650	7650	7650	7650	7650
C.	NET CASH FLOW (B–A)	–1216	1189	2466	3893	5442	5335	6145	6335	6295	6185
D.	Cumulative cash flow	–1216	–27	2439	6332	11744	17109	23254	29589	35884	42069

Note: All costs and returns are calculated at constant price and constant yield per colony. For details see Table 5.11.

Table 5.14: Costs and returns of honey production from beekeeping with *Apis cerana* in Bangladesh using traditional top bar hive
Sensitivity Analysis

Years	Total[1] costs	Total[2] returns	Total returns	Net[3] returns
1	200	960	760	280
2	280	1920	1640	680
3	380	2880	2500	1060
4	440	3840	3400	1480
5	540	4800	4260	1860
6	520	4800	4280	1880
7	500	4800	4300	1900
8	500	4800	4300	1900
9	500	4800	4300	1900
10	500	4800	4300	1900

1. It includes both fixed and variable costs. For details see Tables 5.10 and 5.12.
2. For details see Tables 5.10 and 5.12.
3. A shortfall of 50 per cent assumed in total returns.

Table 5.15: Costs and returns of honey production from beekeeping with *Apis cerana* in Bangladesh by using Newton hive
Sensitivity Analysis

Years	Total[1] costs	Total[2] returns	Total returns	Net[3] returns
1	2746	1530	−1216	−1981
2	1871	3060	1189	−341
3	2124	4590	2466	171
4	2227	6120	3893	833
5	2208	7650	5442	1617
6	2315	7650	5335	1510
7	1505	7650	6145	2320
8	1315	7650	6335	2510
9	1355	7650	6295	2470
10	1465	7650	6185	2360

1. It includes both fixed and variable costs. For details see Tables 5.11 and 5.13.
2. For details see Tables 5.11 and 5.13.
3. A shortfall of 50 per cent assumed in total returns.

of honey per annum. such an expansion in the beekeeping industry can provide gainful employment for an additional 30 to 40 thousand persons. Since bee flora is not available throughout the year, in any region, migratory beekeeping between the lowland and highland areas is being practised with rewarding results (Ahmad, 1990). There are 12 different types of modern and traditional bee hives in use in Pakistan. Some low-cost hives, developed for beekeeping in remote areas, would popularize beekeeping with *Apis mellifera* among those who cannot afford to buy expensive equipment (Muzzafor, 1990). Wax moths, hornets, and mites are the serious pests, predators, and parasites that affect bee colonies in Pakistan. Sacbrood virus disease is a serious problem affecting *Apis cerana* colonies. Studies on the economics of beekeeping suggest that it is a reasonable profit-earning activity in Pakistan, both for part-time as well as full-time beekeepers. The current annual honey production for all different species of honeybees in Pakistan is about 640 MT. The wholesale price of honey at the producer and intermediary levels is 40 to 50 and 60 to 80 rupees per kilogramme, respectively. Honey in small cases and bottles is sold at the rate of 80–140 per kilogramme in city markets.

The North West Frontier Province (NWEP) of Pakistan is very suitable for beekeeping on account of its different ecological zones containing rich bee flora. It has 8.33 million hectares of land of which about 2 million hectares are cultivated. This province has the potential to produce 35 MT of honey per annum against the present low production of 2 MT only.

There are special "bee dens" full of *Apis cerana* colonies, in some specific valleys of the NWFP, where the practice of honey hunting and the collection of wild bee swarms of *Apis cerana* are very popular among the mountain farmers (Khan, 1990). Almost 85 per cent of *Apis cerana* colonies in NWFP were destroyed during 1981–82 due to acarine disease which was introduced from the *Apis mellifera* / *Apis cerana* colonies brought in by Afghan beekeepers. Now the exotic, *Apis mellifera*, is also becoming more popular among the beekeepers of this province, and this species is gradually replacing the native, *Apis cerana*. Afghan refugees brought with them hundreds of *Apis mellifera* colonies of Russian origin, and these have now multiplied into thousand over the past eight to nine years. The United Nations High Commission for Refugees also imported hundreds of *Apis mellifera* colonies from Australia for the Afghan refugees. Therefore, the NWFP now has *Apis mellifera* from Russia, Australia and Europe (Shahid, 1990).

The estimation of costs and returns for beekeeping with *Apis mellifera* for part-time beekeepers having five and 80 colonies and for full-time beekeepers operating 250 and 500 bee colonies have been worked out by Ahmad (1986, 1988). According to these estimates, only five

Table 5.16: Economics of beekeeping with *Apis mellifera* in Pakistan 1988* (Part-time beekeepers with five colonies in Langstroth hive, 1988)

Item	Amount (Pak. Rs.)**
I. CAPITAL EXPENDITURE	
Packages bees @ Rs.600 per 1/2 kg	60
Hives (wooden) @ Rs.500 each	50
Honey extractor	—
Nucleus hives each @ Rs.100	10
Comb foundation sheets @ Rs.50 kg.	100
Misc. tools	20
Total fixed cost:	240
II. VARIABLE COST	
Supplement feeding 15 kg per colony @ Rs.9/- per kg	135
Misc. expenses	20
Total variable cost:	155
III. TOTAL COST (I+II) =	395
IV. GROSS INCOME	
Honey 18 kg per colony @ Rs.50/- per kg.	900
Bees wax 1/4 kg per hive @ Rs.30/- per kg.	7.4
Total income	907.40
V. NET RETURN	
Return over variable cost = (IV–II) =	752.40
Return over total cost = (IV–III) =	512.40

* Table drawn from article by Ahmad, R. (1988).

** One U.S. Dollar = 20 Pakistan Rupees

colonies of *Apis mellifera* can be maintained at one place throughout the year, and in order to procure surplus honey yields from 80, 250 and 500 colonies of *Apis mellifera* they need to be migrated between the mountains and the plains to exploit fully the floral resources of the country. (Table 5.17). Since a wooden Langstroth hive is too expensive for the poor farmer, Pakistan Agricultural Research Council (PARC), Islamabad, has introduced low-cost hives made of cheaper material, such as hives made of cement movable frame, clay and chopped wheat straw "Multani mitti" (special clay), clay and rice husk. These low-cost

hives have the dimensions of a Langstroth hive.

The costs and returns per colony of *Apis mellifera* kept in standard Langstroth hives and low-cost hives are given in Tables 5.16 and 5.18, respectively. These estimates reveal that the annual cost of installation and operation of one colony of *Apis mellifera* in a standard Langstroth hive and in a low-cost hive is Rs.395 and 319, respectively. Out of these total expenditure, the capital expenditure for operating one colony of *Apis mellifera* in a standard Langstroth hive and in a low-cost hive is Rs.184 and 240 and the variable costs are Rs.155 and 135, respectively. A bee colony generates a net profit of Rs.512 and 289, respectively.

Cash flow projections of honey and beeswax production are given in Tables 5.19 and 5.20. The data in these tables indicate that during the first year of operation, the entrepreneur will incur a loss of Rs.1,295 and 735 by using a Langstroth hive and a low-cost hive, respectively. Subsequently, he will earn profit during the using both types of bee hives. The accumulated profit during the period of 10 years has been estimated at over Rs.42,000 and 25,000 with Langstroth and low-cost hives, respectively. The loss incurred in the first year will be recovered in the following two years with both kinds of hives and there will be a profit of Rs.430 each with Langstroth and low-cost hives. Sensitivity analysis results suggest that by reducing the income by 50 per cent, the activity will incur losses during the first three years of operation and generate profit from four to 10 years (Tables 5.21 and 5.22).

Table 5.17 reveals that a beekeeper operating 80, 250, 500 colonies of *Apis mellifera* in standard Langstroth hives will earn a net profit of 20,475, 54,600 and 131,700, respectively, during the first year and 32,275, 91,525 and 205,400 in the third year, respectively (Ahmad, 1986, 1988.).

5.6 CHINA

There are at present more than 7 million honeybee colonies kept in modern hives in China. Out of these, 70 per cent are the European *Apis mellifera* and others are the native *Apis cerana*. The annual honey production is over 200,000 MT per year, and the total royal jelly and bee pollen production is 800 and 1,000 MT per year, respectively. In addition, beeswax and propolis are two other important hive products harvested. About 30 to 40 per cent of the these hive products are exported and the rest are used for domestic consumption. About 90 per cent of honey and all the royal jelly in China is produced from *Apis mellifera*.

The Institute of Apicultural Sciences, of the Chinese Academy of Agricultural Sciences, is mainly responsible for beekeeping research

Table 5.17: Investment and income from bee

Item	Low cost hives/ stationary colonies	Langstroth hives			
		Part-time beekeeper		Full-time beekeeper	
No. of European bee colonies	5	5	80	250	500
Capital expenditure		Amount in rupees			
Package bee @ Rs.600 per 1.5 kg	3,000	3,000	48,000	150,000	300,000
hives each @ Rs.500 & low cost @ Rs.30	150	2,500	40,000	125,000	250,000
Transport (one Suzuki pick-up)	—	—	—	62,000	62,000
Comb foundation machine	—	—	—	12,000	12,000
Honey extractor	—	—	6,000	7,000	8,000
Nucleus wooden hives @ Rs.100 and low cost Rs.10	50	500	4,000	10,000	20,000
Pollen traps each @ Rs.200	—	—	2,000	4,000	8,000
Comb foundation sheets @ Rs.50 per kg	500	500	8,000	25,000	50,000
Misc. tools	200	200	500	1,000	2,000
Total:	3,900	6,700	108,500	396,000	712,000
Cost of production					
Raw material (pollen and nectar)		Free gift nature			
Migration of colonies	—	—	5,000	15,000	30,000
Supplemental feeding 15 kg per colony @ Rs.9 per kg	675	675	10,800	33,750	67,500
Depreciation (10%) on equipment	40	320	5,250	22,100	36,200
Interest (15%) on capital exp.	585	1,005	16,275	59,400	106,800
Rent of store	—	—	2,400	4,800	7,200
Rent of apiary site in the form of honey	—	—	600	1,500	3,000
Bee attendant Rs.800 per month	—	—	9,600	28,800	57,600
Misc. expenses	—	100	1,600	5,000	10,000
Total:	1,300	2,100	51,525	170,350	318,300

keeping with *Apis mellifera* in Pakistan, 1988

Item	Low cost hives/ stationary colonies	Langstroth hives			
		Part-time beekeeper		Full-time beekeeper	
No. of European bee colonies	5	5	80	250	500
Capital expenditure		Amount in rupees			
Gross income					
Honey 12 kg in low cost @ 18 kg per wooden hive Rs.50 per kg	3,000	4,500	72,000	225,000	450,000
Royal jelly 5 kg per 100 colonies @ Rs.1500 per kg	—	—	6,000	18,750	37,500
Wax 1/4 kg per hive @ Rs.30 per kg	37	37	600	1,875	3,750
Pollen 1/2 kg per colony @ Rs.50 per kg	—	—	2,000	6,250	12,500
Package bees 15 kg per 100 colonies @ Rs.400 per 1 1/2 kg	400	400	3,200	10,000	20,000
Total:	3,437	4,937	83,800	261,875	523,750
Net income					
Income will be only from honey production in the first year, honey and package bees in the second year and honey, royal jelly, wax, pollen, and package bees during third year and onwards.					
First year	1,700	2,400	20,475	54,600	131,700
Second year	2,100	2,800	23,675	64,650	151,700
Third year	2,137	2,837	32,275	91,525	205,450

Source: Ahmad, 1988.

and extension activities. There are more than 100,000 apiaries in China, each having 30 to 80 bee hives. Beekeeping *Apis cerana* is practised mainly in the mountain areas (Zhenming, 1990).

Table 5.18: Economics of beekeeping with *Apis mellifera* in Pakistan using low cost hives, 1988

Items	Price (Rs.)	Life (Years)	Cost/year/ Colony (Rs.)
	COSTS		
I. CAPITAL EXPENDITURE			
Package bees 1/2 kg	600	—	60.00
Low cost hive	30	10	3.00
Nucleus hive	10	10	1.00
Comb foundation sheets	50/kg	5	100.00
Misc. tools	200	10	20.00
Total fixed cost:	—	—	184.00
II. VARIABLE COST			
Supplement feeding 15 kg sugar @ Rs.9/- per kg.	135	—	135.00
Total variable cost:	—	—	135.00
III. TOTAL COST (I + II) = 184 + 135 =			319.00
IV. GROSS INCOME			
Honey 12 kg per colony @ Rs.50/- per kg			600.00
Bees wax 1/4 kg per hive @ Rs.30/- per kg			7.50
V. TOTAL INCOME			607.50
VI. NET RETURN			
Return over variable cost = IV–II =			472.50
Return over total cost = IV–III =			288.50

Source: Ahmad, 1988.

Royal jelly is one of the most important hive products for which production technology has been developed in China after 1959. In southern China, it ranges from 0.3 to 0.5 kg per colony a year. Experiments are also being conducted to produce royal jelly from *Apis*

cerana colonies. However, this native bee species produces only half the quantity of royal jelly in comparison to *Apis mellifera*. Since royal jelly changes in chemical composition during storage, markets for selling fresh royal jelly are being established. Royal jelly is also being used as a raw material in medicines, tonics, beverages and cosmetic products.

Production of pollen, as a commercial hive product, started in 1983. It is collected in plastic pollen traps at the entrance of the bee hive. Pollen is used in health foods, tonics, and medicines. Venom production started in 1953 in China, and is now used to cure arthritis and cancer. Only European honeybees, *Apis mellifera* produce propolis and this is used for medicinal purposes. Propolis production technology is still in the development stage in China (Guanhuang, 1990).

China, which is 9.6 million sq km in area, contains mountains, rolling hills, great plateaux, huge basins and vast plains: and it spans the north temperate, temperate, subtropical and tropical zones. The nectar plants characteristic of an area depend on the geographical and climatic conditions. The most important nectar plants are: *Eurya* spp., *Eucalyptus* spp., litchi (*Litchi chinensis*), longan (*Euphoria longan*), loquat (*Eriobotrya japonica*), rape (*Brassica napus*), milk vetch (*Astragalus sinicus*), vetches (*vicia* spp., especially *Vicia villosa*), orange (*Citrus* spp.), Chinese tallow tree (*Sapium sebiferum*), jujube (*Ziziphus jujuba*), cotton (*Gossypium* spp.), false acacia (*Robinia pseudoacacia*) chaste tree (*Vitex negundo*), sweet clover (*Meliltus* spp.), alfalfa *Medicago sativa*) buckwheat (*Fagopyrum esculentum*), sunflower (*Helianthus annuus*) and linden (*Tilia* spp.),

Since the late fifties the government departments have organized beekeepers to undertake long-distance migration of colonies in a planned way, moving to the various nectar flows and thus utilizing these plants fully. At present, the subtropical and tropical zones are the main areas for multiplying colonies of the Western bee (in winter and spring) which are used in other regions for the production of honey and other bee products. In the mountain area, however, beekeeping with the native *Apis cerana* is still quite popular (Liu Xianshu, 1985). No information on the economics of beekeeping as worked out for other countries of the Hindu Kush-Himalayan region is available for China.

5.7 BHUTAN

In Bhutan the valleys, lower and high hills with moderate climates are the most suitable areas for beekeeping. Bhutan is rich in its bee resources and all four species of the genus *Apis* are found there. The European honeybee, *Apis mellifera*, was introduced in the Bhumthang and Puntsholing areas in 1986 and 1987, respectively. The native,

Table 5.19: Ten years cash flow projection of honey production from European honeybee *Apis mellifera* in Pakistan using Langstroth hives, 1988

Item	Years									
	1	2	3	4	5	6	7	8	9	10
A. CASH OUTFLOWS										
i) Bees	1200	1200	1200	—	—	—	—	—	—	—
ii) Langstroth hive	1000	1000	1000	1000	1000	—	—	—	—	—
iii) Nucleus hive	200	200	200	200	200	—	—	—	—	—
iv) Misc. tools	200	—	—	—	—	200	—	—	—	—
v) Comb foundation sheet	200	400	600	800	1000	1000	1000	1000	1000	1000
vi) Sugar (15 kg 9/- per kg) for two colony	270	540	810	1080	1350	1350	1350	1350	1350	1350
vii) Misc. expenses	40	80	120	160	200	200	200	200	200	200
Total:	3110	3420	3930	3240	3750	2750	2550	2550	2550	2550

B.	CASH INFLOWS									
i)	Honey (18 kg/ colony @ Rs. 50/ per kg)	1800	3600	5400	7200	9000	9000	9000	9000	9000	9000
ii)	Bees wax (1/4 kg) (1/2 kg per two colonies Rs. 30/- per kg)	15	30	45	60	75	75	75	75	75	75
	Total:	1815	3630	5445	7260	9075	9075	9075	9075	9075	9075
C.	NET CASH FLOW (B–A)	–1295	210	1515	4020	5325	**6325**	6525	6525	6525	6525
D.	Cumulative cash flow	–1295	–1085	430	4450	9775	16100	22625	27150	35675	42200

Note: All costs and returns are calculated at constant price and constant yield per colony. For details see Table 5.16.

Table 5.20: Ten years cash flow projection of honey production from European honeybee *Apis mellifera* in Pakistan using low cost hives, 1988

Item	Years									
	1	2	3	4	5	6	7	8	9	10
A. CASH OUTFLOWS										
i) Bees	1200	1200	1200	—	—	—	—	—	—	—
ii) Langstroth hive	60	60	60	60	60	—	—	—	—	—
iii) Nucleus hive	20	20	20	20	20	—	—	—	—	—
iv) Misc. tools	200	—	—	—	—	200	—	—	—	—
v) Comb foundation sheet	200	400	600	800	1000	1000	1000	1000	1000	1000
vi) Sugar (15 kg 9/- per kg) for two colony	270	540	810	1080	1350	1350	1350	1350	1350	1350
Total:	1950	2220	2690	1960	2430	2550	2350	2350	2350	2350

B. CASH INFLOWS										
i) Honey (12 kg/ colony @ Rs. 50/ per kg)	1200	2400	3600	4800	6000	6000	6000	6000	6000	6000
ii) Bees wax (0.5 kg) (1 kg per two colonies Rs. 75/- per kg)	15	30	45	60	75	75	75	75	75	75
Total:	1215	2430	3645	4860	6075	6075	6075	6075	6075	6075
C. NET CASH FLOW (B–A)	–735	210	955	2900	3645	3525	3725	3725	3725	3725
D. Cumulative cash flow	–735	–525	430	3330	6975	10500	14225	17950	21675	25400

Note: All costs and returns are calculated at constant price and constant yield per colony. For details see Table 5.18.

Table 5.21: Costs and returns of honey and beeswax production from *Apis mellifera* in Pakistan by using Langstroth hives
Sensitivity Analysis

Years	Total[1] costs	Total[2] returns	Total returns	Net[3] returns
1	3110	1815	−1295	−2202.5
2	3420	3630	210	−1605
3	3930	5445	1515	−1207.5
4	3240	7260	4020	390
5	3750	9075	5325	787.5
6	2750	9075	6325	1787.5
7	2550	9075	6525	1987.5
8	2550	9075	6525	1987.5
9	2550	9075	6525	1987.5
10	2550	9075	6525	1987.5

1. Includes both fixed and variable costs. For details see Tables 5.16 and 5.19.
2. For details see Tables 5.16 and 5.19.
3. A shortfall of 50 per cent assumed in total returns.

Table 5.22: Costs and returns of honey and beeswax production from *Apis mellifera* in Pakistan by using low cost hives
Sensitivity Analysis

Years	Total[1] costs	Total[2] returns	Total returns	Net[3] returns
1	1950	−1815	−735	−1342.5
2	2220	2430	210	−1005
3	2690	3645	955	−867.5
4	1960	4860	2900	470
5	2430	6075	3645	607.5
6	2550	6075	3645	487.5
7	2350	6075	3525	687.5
8	2350	6075	3725	687.5
9	2350	6075	3725	687.5
10	2350	6075	3725	687.5

1. Includes both fixed and variable costs. For details see Tables 5.18 and 5.20.
2. For details see Tables 5.18 and 5.20.
3. A shortfall of 50 per cent assumed in total returns.

Apis cerana, is generally kept in primitive traditional hives by the farmers in southern Bhutan. In the northern parts of Bhutan, there is no beekeeping tradition, because harvesting honey from the nests of honeybees is considered a sin. However, such religious beliefs are changing gradually.

Major honey flow seasons in Bhutan are April-May and October-November. the annual average honey yield from *Apis mellifera* is 3 and 30 kg per colony respectively. Beeswax is the property of the Forestry Department. Traditional log hives are made from oakwood, and modern bee hives are made of blue pine wood. *Acarine* and *Tropilaelaps* mites as well as European foulbrood have been reported on *Apis mellifera*. Local people and tourists are the major consumers of honey which is sold at 50 Bhutanese Nu per kilogramme. There is no research and development programme in beekeeping. However, one Bhutanese national is receiving beekeeping training in Canada.

Apples, oranges, and cardamom are the major horticultural crops grown in Bhutan and occupy about 90 per cent of the total area under fruit crops. All these fruit crops require cross-pollination by honeybees for efficient and sufficient pollination. A conservative estimate of the number of hives needed exclusively for the pollination of horticultural crops, at present, is about 50,000, whereas the present number of bee colonies in modern hives is not more than 100.

Strategies for beekeeping development in Bhutan include exploration of bee genetic resources and zonation of beekeeping areas, survey of honey plant resources and preparation of floral calendars, management of bee colonies for pollination, migratory beekeeping schedules, establishment of extension-cum-demonstration apiaries, beekeeping training programmes. and assessment of the honey market situation (Verma, 1990b).

Introduction of modern beekeeping in Bhutan is very recent and no information on the economics of beekeeping is available. However, Bhutan is close to Nepal and Himachal Pradesh (northern India) is socio-economic and ecological conditions. Thus, it is reasonable to assume that the economics of beekeeping in Bhutan should not be very different.

5.8 BURMA

Large-scale importation of *Apis mellifera* into Burma was done under Food and Agriculture Organization (FAO) of the United Nations project after 1979. Prior of this, five colonies of *Apis mellifera* were imported from Australia and one of them was seriously affected with American foulbrood. Under the FAO project, 500 packages of the Italian bee *Apis mellifera ligustica* were introduced and by 1982, there

were about 1,000 colonies of the European bee in this country (Morse 1982). Simultaneously, more than 50 persons from Burma received training in beekeeping with *Apis mellifera* in Ohio State University Agricultural Technical Institute at Wooster, Ohio in 1980 and 1981. Similarly, others were trained in beekeeping with *Apis mellifera* in other parts of the USA, Europe and Australia. Projects on beekeeping with *Apis mellifera* were started with the idea that by encouraging beekeeping they can convince at least some poppy growers that they can earn the same money or even more by adopting beekeeping. Besides FAO, the Drug Abuse Control Program of the U.S. State Department also financed the beekeeping training programme for Burmese nationals as a part of the strategy to check smuggling of illegal heroin into the world market from the "Golden Triangle" the area where Burma, Thailand and Laos join (Morse, 1982, Tew, 1980). According to Morse (1982), Burma has the potential to support about 10,000 colonies of *Apis mellifera*. The price of honey is about US$ 7.00 per kilogramme and besides helping in solving the serious problem of drug abuse, it can be an ideal alternate source of income to the farmers. Parasitic mites, ants, excessive temperatures and rainfall are some of the serious constraints for developing beekeeping with *Apis mellifera* in Burma.

5.9 CONCLUSIONS

Studies on the economics of beekeeping in Bangladesh show that beekeeping can be started with a very low investment and even the poorest farmer can go for it with the minimal support.

Economic estimates from Pakistan reveal that this enterprise can be taken up both at the household and commercial levels to generate substantially more profits and employment.

In Himachal Pradesh in India, this enterprise has a dual purpose of generating income and increasing horticultural output through pollination activities of honeybees. Native *Apis cerana* is being replaced with exotic *Apis mellifera* because the net profit doubles due to higher honey yield of the exotic bees. High profit from beekeeping with *Apis cerana* in Nepal is primarily because of the high price of honey in Nepal and not because of higher yield. If beekeeping with *Apis cerana* is managed at a commercial level, the profit may be quite high.

All these studies clearly show that beekeeping is a profitable enterprise and with great potential in the mountain areas where forage for the bees is available. Some other findings are as follows:

1) The initial investment in this enterprise is very low as compared to any other productive activity.

2) The returns are low with only one or two colonies but there is flexibility to increase up to a size of 10 colonies without much investment.

3) It can be taken up as a poverty-elevation programme with little support/subsidy in the initial years.