



Status Paper

Beekeeping in Himachal Pradesh: way to an economic entrepreneurship

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Abstract

Beekeeping is considered as an ancillary activity and an alternate to farmer for increased farm income. It also has been regarded as a sole profession in stationary and migratory mode. Annual profit estimate from migratory unit of 100 colonies is about six lakh and seventy-five thousand per year. In contrary to generalized statement that beekeeping is a low input and high output profession, an effort to practically understand the economics, limiting factors and thereafter alternatives to make unit economically viable has been made. Among the limiting factors; various diseases and enemies, low honey price, high input cost and less profit. To sustain apiaries in state, a requirement of about 20.8 kg of dry sugar/honey bee colony/year has been worked out. To overcome these impediments, proper infrastructure, channelized methodology and enhanced awareness is needed. Skill based trainings would be instrumental in growth of beekeeping sector in the state and large-scale involvement of beekeeping enthusiasts.

Key words: Honey, hive products, beekeeper, honey bees, Himachal Pradesh, beekeeping

Scope of beekeeping in Himachal Pradesh

Himachal Pradesh is nestled in the lap of the western Himalayan Mountain range with a vast area under forest, horticulture, and agricultural crops. The state has a total geographical area of 55,673 km², forest cover of 15,433.52 km² (ISFR 2019). Of its total 10.3 lakh hectares of gross cropped area, 2.3 lakh hectares is under horticultural crops and an annual fruit production of 565.3 thousand metric tons. Most of these crops are insect-pollinated and require cross pollination. Beekeeping is an excellent pollination support to the fruit growers of the state besides providing outcomes to the beekeepers. Annual honey production in the state is about 5.85 thousand metric tons (NBB 2023). The earliest record of beekeeping in state was reported in 1882-1884 when Sir Louis Dane, kept honey bees in modern hives. The modern beekeeping in H. P. was introduced in 1934 in Kullu valley and in 1936 in Kangra valley (Sharma *et al.* 2022). Himachal is blessed with different agro-

climatic conditions and crop diversity. Such diversity of geographical pockets allows varied flora and fauna to flourish and offer great potential for commercial beekeeping and vast scope to expand beekeeping as an entrepreneurial activity.

The state is a hub of beekeepers and known for its first-time successful establishment of *Apis mellifera* in India. Before 1971 there were only 1250 honey bee colonies in modern bee hives in Himachal Pradesh. The number of honey bee colonies maintained by beekeepers is on the rise and now has increased to 20.05 lakhs colonies in 2022 (NBB 2023). Diverse flora in different geographical pockets has tremendous potential for entrepreneurial and stationary beekeeping. Traditionally, the native bee, *Apis cerana* was utilized for beekeeping. *A. cerana* considered as natural heritage of mountain communities was reared in log, wall, pitchers, and box hives (Verma and Partap 1993). In Chamba district on an average 2.45 hives per house with hive occupancy rate of 53.94% has been

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documented that realizes the richness of this bee culture (Verma and Attri 2008). In another district Sirmaur where average annual production of honey remains between 1.72 to 3.38 kg per wall hive and on an average 2.92 colonies in wall hives per house with occupancy rate of 71.94% (Kumar and Thakur 2014). But recently *A. mellifera* beekeeping due to its suitability as a managed bee for honey production and efficient pollinator in crops is being preferred by beekeepers. It is therefore an increase of 15 per cent in honey production every year in the state has been documented (NBB 2023). Beekeeping constitutes a wholesome venture, as other than honey, bees also provide bees wax, bee pollen, propolis, bee venom and royal jelly.

For promotion of organic farming, the State Department of Agriculture intends to increase the area under organic agriculture and organic certification (approximately 2000 ha area) in all districts. State administration has also approved the organic policy for the state so the major emphasis be laid on the promotion of Organic Farming in the coming years. Multifloral and unifloral honeys produced in the state from different organic medicinal flora and from various geographical regions has a huge demand in the country. The most preferred honeys in market are; multi-floral Himalayan honey, litchi honey, wild thyme honey, white honey, and *Acacia* honey. Besides honey production, in recent years much attention is given to commercial utilization of honey bees as pollinators. Beekeeping for diversified hive products and maintaining colonies for efficient pollination in temperate horticultural crops can be regarded as an entrepreneurial activity for unemployed youth. Pollinators affect 35 per cent of the world's production (Roubik 1995; Delaplane and Mayer 2000) and honey bees are among the most exploited pollinators worldwide. Therefore, beekeeping industry is an excellent pollination support to the fruit growers of the state besides providing reaping outcomes to the beekeepers.

Progressive beekeepers intend to organic certification and proper processing for their honey and other hive products to do well in the domestic market

and subsequently enter the export market. But few or none of farm certification and lack of processing infrastructures are the reasons for halt in the revenue and trade value of hive products. Honey marketing is major constraint that discourages the beekeepers as they are not aware of honey standards. About 65-70 per cent of the beekeepers have highlighted the problem of honey marketing and low price of their bee products (Kumar and Singh 2002; Bansal *et al.* 2013). The raw bulk honey produced by the beekeepers fails to meet the national and international standards. Non-fixation of minimum support prices for honey and unorganized market are the other bothersome limitations in the marketing of bee products. Also, there is no specific market for the sale of honey, and the beekeepers are selling their products mostly locally or in nearby areas without any brand name and are getting very less price Gatoria *et al.* (2003).

Honeybee predators, wasp species are the major limiting factor in the state desolate colonies up to 20 to 25 percent annually (Gulati and Kaushik, 2004). Wasp intercept honey bee at hive entrances and fly back to his nests carrying bee to feed their larvae Adlakha *et al.* (1975). Five wasp species namely; *Vespa mandarinia*, *V. auraria*, *V. orientalis*, *V. basalis* and *V. tropica* predate honey bees in rainy season. Maximum attack by *Vespa auraria*, *V. basalis* and *V. mandarinia* occurs during July to November in the mid hills zone of Himachal Pradesh when temperature and relative humidity remains high Rana *et al.* (2000). The beekeepers often tend to escape dwindling of their colonies due to wasp attack and make their way to plains.

Various insect pollinators coexist with honey bees include: solitary bees, bumble bees, and dipteran flies. Bumble bee, *Bombus haemorrhoidalis* has been commercially reared under laboratory conditions and used for pollination of some polyhouse crops that are otherwise not pollinated effectively by honey bees Dayal and Rana (2004). While foraging, on varied flora, these efficient creatures are also keeping alive many entomophilous and wild crops and helping in maintenance of ecological balance.

Economic model presented in the paper is

exclusively considered for the normal climatic conditions and with the normal yield and product values (Table 1). The economics may vary with the congenial climate prevailing during honey flow season, good price in the market and absence of natural

calamities. This economic model would be helpful for beginners and the old beekeepers to redefine the management practices to maintain strong colonies for higher honey production and further colony multiplication.

Table 1. Economic modeling of Beekeeping to Profitability

		Number of colonies			
		10	50	100	500
Capital costs (₹)					
Bee Hives (Teak, Mango, Acacia) @ (₹) 2100/-*		21000	105000	210000	1050000
Bees @ (₹) 1750/- (Five frames)		17500	87500	175000	875000
Iron Hive stand @ (₹) 250/-		2500	12500	25000	125000
Essential equipment**					
Extractor capacity (8 kg) = ₹ 8000/-, hive tool HT = ₹ 200/-, bee veil BV = ₹ 150, smoker = ₹ 600/-, CFS = ₹ 26/-piece, uncapping knife = ₹ 100, Tent = ₹ 10000 /- extraction net = ₹ 6000/-, stainless steel honey filter = ₹ 6000/-, stainless steel honey drums = ₹ 2000/-, steel tub = ₹ 200/-, glass bottles = ₹ 32/- (1kg) and ₹ 17/- (500 g), labels and stickers = ₹ 10/- a set, etc.					
		33250	104000	164300	753000
	Total	74250	309000	574300	2803000
Recurring Costs					
Depreciation (hives & other equipment excluding bees @ 10%)		5675	22150	39930	192800
Labour (Full time @ ₹ 10000/- p.m.)		Self	1 Full Time	1 Full time	4 Full time
			120000	120000	480000
Migration charges (to & fro to Rajasthan/ Haryana)		Stationary	30000	60000	180000
Other (sugar, feeders, gunny bags, medicines, etc.)	Sugar	20.80 kg/col/yr	11.05 kg/col/yr	11.05 kg/col/yr	11.05 kg/col/yr
Sugar	@ ₹ 45	9360	24863	49725	248625
Feeder	@ ₹ 50	500	2500	5000	25000
Sulphur (@ ₹ 18.30/colony/year)	@ ₹ 48.3	483	2415	4830	24150
Gunny bags for winter packing	@ ₹ 12.5	125	625	1250	6250
Pollen traps	@ ₹ 200	1000	2000	6000	20000
Venom collector	@ ₹ 9800	-	9800	19600	39200
Propolis screens	@ ₹ 175	-	1750	3500	35000
Pollen substitute (min. 0.4 kg/ colony/year)	@ ₹ 50/kg	200	1000	2000	10000
Total expenditure		17343	217103	311835	1261025
Income from sale of colonies (end of first year)		3000	30000	75000	375000
Income from wax		-	1600	3200	8000
Honey production (kg)***		100 kg	2000 kg	4000 kg	20000 kg
Income from sale of honey (₹)**** 200/kg		100x 200=20000	4 lakh	8 lakh	40 lakh
Pollen production (kg)***		3 kg	15 kg	30 kg	150 kg
Income from sale of pollen(₹)**** 800/kg		2400	12000	24000	120000
Bee venom production (mg)***		350 mg	1750 mg	3500 mg	17500 mg
Income from sale of bee venom (₹)**** 10,000/g		3,500	17,500	35,000	1,75,000
Propolis production (kg)***		1kg	5kg	10 kg	50kg
Income from sale of propolis(₹)**** 1000/kg		1000	5000	10,000	50,000
Profit (₹)		12,557	2.49 lakh	6.35 lakh	34.6 lakh

* Cost of hive made of kail wood/superior timber wood in Himachal Pradesh

** 500 colony apiary require 5 times and equipment cost is also variable for small apiary

*** Honey yield 10 kg for stationary and 40 kg for migratory beekeeping (minimum/year)

**** Farmgate marketing of honey doubles the profit

Beekeeping as an option for Covid-19 migrants of Himachal Pradesh

Amid the crisis of COVID-19 pandemic, small farmers and migrants have been left stranded and rendered jobless. As per Himachal Pradesh Government, 94,819 migrants had gone out from Himachal to various states of the country by June 2020 and over 1.5 lakh have returned back to state (SDMA, 2020). To such homeless migrants and job seeking youth, beekeeping can be a safer job option in the lockdown. The migrant workers can be provided with bee boxes and the tool kit so that they become able to make a better livelihood through setting up small apiaries. In this way, the youth would no longer need to leave their home state in search of jobs.

Sustaining colonies in long dearth periods

Honey bee colonies need extra care during long winters and monsoon seasons. A study at Bee Research Station, Nagrota Bagwan was conducted to work out the prevailed floral dearth periods in mid hill zone of Himachal Pradesh and found that there was a dry period of 32 weeks. To supplement for honey or nectar, an artificial sugar syrup as feed an average strength single colony of honey bees require 0.650 kg of dry sugar in a week. A total of 20.8 kg of sugar is required during one year for one colony. We can shift our colonies in nearby area with *Acacia* plantation in July to August to have 5-week natural feed for colonies and extractable honey as well. Commercial *A. mellifera* beekeepers often migrate their colonies to plains on mustard and this makes them to avoid dwindling of colonies and artificial feed for 10 standard weeks.

Indian Beekeeping scenario

At present, there are about 1.934 million honeybee colonies of native *A. cerana* and exotic *A. mellifera* maintained in traditional and modern beehives in India. Honey production has increased from 76150 metric tons in the year 2013-2014 to about 133,000 metric tons in the year 2021-2022 (NBB 2022). India is one of the major exporters of raw honey to USA, Saudi Arabia, UAE, Nepal, Bangladesh etc. During 2015-16, an export of 38.2 thousand metric ton of honey valued¹ 706 crores while it was increased to 79,929.17 MT worth Rs. 23.3 billion in 2022 and is

expected to grow at a CAGR of 8.4% to Rs 38.8 billion by 2028 (APEDA 2023). In honey production India ranks 2nd in world while China has its supremacy globally in honey production. As per an estimate, India has a potential to rear 200 million bee colonies that can provide self-employment to over 12 million rural and tribal families (Bhatnagar *et al.*, 2020). It would also create opportunities to boost the output of bee related products and overall enhancement in agricultural and horticultural productivity.

Utilization of honey bees as pollinators looks to be imperative world over to increase crop productivity and restoring biodiversity. As per an estimate the value of honey bees as pollinator is 18-20 times more than their value as producers of honey and other hive products. In India crops benefitted by insect pollination are grown in an area of about 50 million hectares (Gupta and Gupta 1997). A few commercial beekeepers of Himachal are renting their bee apiaries @ of Rs. 1900/- per colony during 2022 for pollination in mustard crops in Gujarat.

Wasp and hornets are widely distributed and cause 30% losses globally, Asian hornet, *V. velutina auraria* has recently established in Europe and has alone been reported to cause losses up to 30 per cent Monceau *et al.* (2014). In India, wasps are considered most serious predators of honey bees which pose considerable threat to both the domesticated species *viz.*, *A. cerana* and *A. mellifera* colonies (Abrol 1994).

Methodology: The survey was conducted in different districts of Himachal Pradesh namely, Kangra, Mandi, Kullu, Una, Chamba and information was collected from 10 beekeepers from each district. The data maintained at Beekeeping Research Station have contributed in developing this report for the benefit of entrepreneurs in Himachal Pradesh. Survey data from different locations in HP have been compiled and correlated. Status of beekeeping with established economics was analyzed to realize required changes. Various practical level factors have been considered for development of beekeeping enterprise in the state.

Limiting factors in expansion of beekeeping

Many restraints impair the development of beekeeping in the state. Bee mortality due to excess use

of pesticides in orchards and blooming crops cause losses to honeybees Kumar and Kundal (2016). Majority of beekeepers are not aware of scientific management during dearth periods and apiaries succumb to attack by various pests and predators. Pests like wax moths, wasps, mites, and diseases pose a significant threat to beekeeping (Sharma and Kumar 2011; Sharma *et al.* 2013; Thakur *et al.* 2021). In honey production, natural factors like bad weather are a major constraint, consistent inclement weather prevailing during build up and honey flow periods lead to failure of crop and extractable honey Singh *et al.* (2002). Migration of honey bee colonies is carried out by most of the beekeepers of the state during lean periods when bee flora is in scarce (Sharma *et al.* 2011). Migration of bee colonies to rich bee flora areas require a lot of manpower, high transport cost, mortality of bees during transportation and interference of highway police are other problems of beekeepers. Also, every year increasing cost of honey bee colonies, high cost of equipment particularly the hives is another limiting factor in its expansion.

Steps to minimize limiting factors

The impediments in the way of developing this activity as an entrepreneurial industry need conscious efforts at community level. The interest of young entrepreneurs through awareness programs needs to be developed by providing them with initial support and estimates of economical budgeting. Efforts should be made to promote and encourage small farmers for beekeeping, so that they may earn extra income along with farming. Establishing big regional nucleus apiaries in the potential areas for quality queen rearing of honey bees and establishment of honey processing and grading facilities is the need of the hour. Plantation of bee friendly flora at appropriate places and engaging women self help groups in their maintenance can be a viable option. These women groups can also be trained as local artisans for

stitching bee veils and manufacturing other bee keeping equipment. Supply of bee colonies on rental basis from the registered beekeepers to the orchardists for pollination during flowering season may be ensured by the line department. Arrangements for marketing of honey produced by private bee keepers following good management practices with minimum support price should be the priority of the concerned department. Value of additional yield from pollination services by honey bees alone has been estimated about 15-20 times more than the value of all hive products put together. Beekeeping has been included as an activity for promoting cross pollination under National Horticulture Mission since May 2005 with a view that honey bee pollination increase yield up to 20 per cent and under this mission a provision is must for additional support to beekeeper against the additional revenue generated through crop yield.

Conclusion

Honey having several medicinal properties has rising demand in the nutraceutical, pharmaceutical and cosmetic industries. Honey processing is an important income avenue and it has emerged out as a multidisciplinary approach where small and marginal farmers can also opt its desired components to start their direct income. Valiant hive products other than honey, need careful modeling for their production so that they too can be incorporated in more profitable integrated beekeeping systems also bee flora rich sites must be harnessed for stationary apiaries (20-25 colonies) to get local honey and for pollination in integrated cropping system. In the present scenario, beekeeping would provide food & energy supplements as balanced nutrition and employment to youth affected due to COVID-19 by establishing apiaries. Therefore, there is an urgent need to frame suitable strategies for this emerging enterprise as a source of permanent income.

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