

Review Article

Political, economical, social, technological and SWOT analysis of beekeeping as a successful enterprise in India: An overview

Aditya Narang

University Institute of Agricultural Sciences, Chandigarh University, Gharuan (Punjab), India

Dhruv Kumar

University Institute of Agricultural Sciences, Chandigarh University, Gharuan (Punjab), India

Garima Gupta*

University Institute of Agricultural Sciences, Chandigarh University, Gharuan (Punjab), India

*Corresponding author. Email: garima.e8884@cumail.in

Article Info

<https://doi.org/10.31018/jans.v14i1.3312>

Received: January 24, 2022

Revised: March 6, 2022

Accepted: March 9, 2022

How to Cite

Narang, A. *et al.* (2022). Political, economical, social, technological and SWOT analysis of beekeeping as a successful enterprise in India: An overview. *Journal of Applied and Natural Science*, 14(1), 194 - 202. <https://doi.org/10.31018/jans.v14i1.3312>

Abstract

Agriculture provides food for more than half of India's population. Entrepreneurial development among rural people is becoming more widely acknowledged as a strategy for overall rural community development. Rural people's entrepreneurial growth is increasingly being recognised as a strategy for achieving total rural community development. Beekeeping is an example of a successful agricultural business. By becoming entrepreneurs, beekeepers can increase their earnings and social capital. By boosting the income of rural beekeepers, reducing poverty, and protecting biological systems through pollination, entrepreneurial behavior contributes to sustainable development. The current review focuses on the several aspects of beekeeping as a profession on the core ideas of beekeeping entrepreneurship, its history, the distribution of honey-producing regions, and the wishes for its entrepreneurship development in India, as well as the important reasons for encouraging entrepreneurship. The current situation of beekeeping entrepreneurship in India, as well as the problems and opportunities it brings, were examined. This study examines the Strengths, Weaknesses, Opportunities, and Threats (SWOT) and Political, Economical, Social, and Technical (PEST) analyses of beekeeping as a business. As a result, the user is able to extensively research the market before beginning any new business. The focus of the review is on the business elements of beekeeping. In addition, the study highlights the beekeeping industry's future possibilities as well as the regulations sought by the Indian government.

Keywords: Beekeeping, Business Entrepreneurial development, Economical

INTRODUCTION

Agriculture is the backbone of India's economy. Approximately 58 percent of India's population works in agriculture. Agriculture continues to develop at a rate of less than 2%, while India's industrial and service sectors rise at a dizzying speed. In the long run, however, the fortunes of other sectors are inextricably linked to the fortunes of agriculture due to further and backwards linkages. As a result, the agriculture sector continues to determine India's economic standing, and this condition is likely to change in the near future (Anandhy and Beula, 2019). The United Nations estimates that India's population will surpass China's in 2024, two years later than expected, and will reach 1.5 billion in 2030. India faces two major problems in terms of quantity as a result of providing young people with jobs and nutritious food in sufficient quantities (Nath *et al.*, 2019). Honey

has a rich history of human use, and it is usually consumed intact (liquid, crystallised, or in the comb) (Anandhy and Beula, 2019). In terms of playing a critical role in addressing these issues, the beekeeping industry holds much promise. Entrepreneurship is widely seen as a necessary component in developing environmentally friendly products and processes. Entrepreneurship promotes long-term growth and can aid in the resolution of a wide range of social and environmental issues. The process of recognising, analysing, and generating new opportunities and possibilities is defined as entrepreneurship (Popa *et al.*, 2012). Entrepreneurship may also be defined as the act of creating something unique and useful by putting in the necessary time and effort, embracing financial, psychological, and social risks, and reaping financial and personal benefits (Popa *et al.*, 2011). Beekeeping is the practice of caring for and feeding honeybees. Beehives, also

known as beehive colonies, are typically found in man-made structures. According to 'India's National Commission' on agriculture, at least 200 million honeybee colonies are needed to pollinate and enhance the productivity of 12 major self-sterile crops that require insect pollination. There will be 215 lakh jobs created, and 10 million tons of honey will be produced (Nath *et al.*, 2019). Beekeeping is an enticing, lucrative, and intriguing rural agri-horticulture business. It does not require cutting-edge technology, a large financial investment, or vast infrastructure. It is effective as an allied activity in an integrated agricultural system for boosting the farming community's economy. A beekeeper keeps bees to harvest honey and other hive products, fertilise crops, or breed bees for sale to other beekeepers. Beekeeping has several advantages, including providing self-employment to rural and forest-based populations, the production of honey, pollen, beeswax, venom, and royal jelly, providing employment to rural educated youths in the collection, processing, and marketing of bee products, and it is most important in the cross-pollination of various agricultural and horticultural crops, thereby improving their quality. The objective of this study is to perform a SWOT (strengths, weaknesses, opportunities, and threats) analysis and a PEST (political, economical, social, and technical) analysis of beekeeping as entrepreneurship. This is good because it lets the person who is starting a new business study the market very carefully before they start. The review focuses on the business elements of beekeeping. The analysis also emphasises the industry's future prospects and the Indian government's regulatory priorities.

Indian history and current scenario

Honey has been known to Indians since the prehistoric age, and it is said to be the first sugary thing they tasted. Anthropologists have discovered evidence of this in the form of paintings created by them in caves (Jaiswal and Shaymrao, 2019). Honey is also mentioned in the Rigveda, Upanishads, Bhagavad Gita, and Ramayana, among other important Hindu literature. Although Indians had known honey and honeybees for centuries, the methods of extracting honey and culturing bees were very out of date when compared to beekeeping in the modern world. There was no advancement in apiculture until the Elizabethian era, and the start of modern beekeeping was first successfully marked in 1851 with the introduction of the principle of bee space by L. L. Langstroth and the invention of the honey extractor by AD Major Von Hruska in 1865, as this served as a trigger to bring a revolution in the field of beekeeping (Ghosh, 1994). In India, efforts to start modern bee farming began in the late 1800s but gained attraction after the Royal Commission on Agriculture recommended the development of cottage businesses in 1928 (Rahman,

2017). In 1962, Nagrota Bagwan became the first place in the world to effectively raise a European honeybee (*A. mellifera*) capable of producing more honey than the indigenous honeybee (Himachal Pradesh). *A. mellifera*, *A. cerana*, *A. dorsata*, and *A. florea* are the four honeybee species currently used in India for honey production. At present, India stands 8th with approximately 1,20,000 MT of total honey production annually (PIB Delhi, 2022), and at present, there are more than 2,50,000 farmers in India practicing beekeeping (Srivastava, 2019). Figure 1 represents the honey production data in India from 1961 to 2019. Between 1961 and 2019, India's honey output climbed by almost 236 percent. Between 1961 and 1981, there was a dramatic growth of 25000 tonnes in honey output, which also speaks to market demand for honey and other bee products. It was also around this time that the high-yielding European honey bee, *Apis mellifera*, was successfully introduced for the first time in India (www.fao.org).

Status of beekeeping in different regions of India

India produced 1.05 lakh metric tons of honey in fiscal years 2017-2018. India is known for producing the world's healthiest and most delicious honey. In China, there are approximately 35 lakh bee colonies. According to surveys, India sells 50 percent of its total honey production to international markets. Over 61 percent of India's total honey production is produced in West Bengal, Uttar Pradesh, Punjab, and Bihar, to name a few. In 1938-39, Beekeepers of India organised themselves and founded the 'All India Beekeepers Association'. Afterwards, the Indian Council of Agricultural Research (ICAR) established the first Beekeeping Research Station in Punjab in 1945 and 6 years later at Coimbatore in Tamil Nadu. During 2020-21, India exported 59,999 metric tonnes (MT) of natural honey worth Rs. 716 crore (US \$96.77 million), with the United States accounting for the lion's share at 44,881 MT (PIB Delhi, 2022). West Bengal is one of the country's top honey-producing states. The two states in India that produce the most honey are West Bengal and Punjab. Punjab does not come in second place in honey production, but it is on par with West Bengal. Compared to the previous year, all of the major states aim to hire 215 lakh workers to produce 10 metric tons of honey. The statistics of the few states that contribute to honey production are listed below (<https://theindianblog.in/top-10-states-india/top-10-honey-producing-states-in-india/>). In regard to manufacturing facilities set up in states, Maharashtra has the most and is the market leader. Tamil Nadu, Karnataka, Punjab, and Rajasthan are some of the other significant states. Punjab has a surplus of wheat, rice, honey, and flowers for export (Economic Survey of Punjab, 2000). During 2019-2020, 15.80 MT of honey was produced in the state under the beekeep-

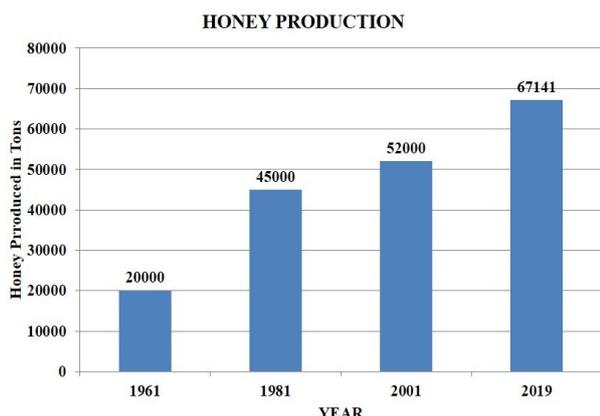


Fig. 1. Honey production in India from 1961 to 2019

ing programme (IBEF Presentation, 2019-20). Punjab produces 25% of the country's honey, and its 23,000 beekeepers export over 3,000 tonnes of honey worth Rs 15 crore each year to the United States, the United Kingdom, and other European countries, as well as the Middle East. This consignment is part of a 5,500-tonne overall production from 2.5 lakh Italian honeybee colonies. Punjab has 33000 beekeepers. The average honey yield in Punjab is 35 kg per bee colony per year, with a maximum of 80,000 bees (Singh *et al.*, 2016). Himachal Pradesh, owing to its varied agro-climate, has a great variety of bee forage sources that provide the basis for the development of the beekeeping industry in the state. Scientists in the horticulture department traced the state's history of beekeeping to 1934, when it first started in Kullu Valley and then in Kangra in 1936. While *A. cerana indica*, the Indian honeybee, was initially reared, *A. mellifera*, an Italian bee, was introduced at Bee Research Station, Nagrota (Kangra) in 1961. Under the Bee keeping programme, 393.01 MT of honey was produced during the year up to 31.12.2020 in the state. Mukhya Mantri Madhu Vikas Yojna' was established to grow high-quality fruit crops and improve production, as well as to increase honey production and other bee products. During fiscal year 2019-20, a fund of 5.00 crore INR was set aside. To date, total grant assistance of 3.03 crore INR has been sanctioned under the FSPF, benefiting approximately 15,387 farmers. Four projects were approved for the 2020-21 fiscal year (through December 31, 2020). These programmes focus on the conservation of indigenous honeybees and the promotion of the honey value chain, as well as integrated farming systems, floral value addition, and climate-resilient vegetable production (Economic survey of Himachal Pradesh, 2020-2021). Haryana ranks sixth in honey production in the country, with 4,800 MT produced. In 2019-20, the country's honey production is predicted to reach 1 lakh metric tons (MT). According to information, 60% of the honey produced is exported, with a value of Rs 600 crore (Krishi Jagran, 2021). The Govt. started a new central

scheme called the 'National Beekeeping and Honey Mission' in July 2020 to promote honeybee industries. An action plan of ` 41.16 crore was sent to Gol for 2020-21, including one quality control lab for 20 crore (Economic Survey of Haryana, 2020). Tamil Nādu Agricultural University (TNAU) is taking steps to promote beekeeping in Tamil Nadu. Kanyakumari district alone accounts for 70 percent of Tamandu's honey production. This district also receives both the southwest and northeast monsoons, which is ideal for beekeeping (Esakkimuthu and Kameswari, 2017).

Beekeeping is becoming an increasingly exciting profession. It can be done by men, women, adults, and even physically challenged and elderly people from all walks of life (Monga and Manocha, 2011). Interpretation of data from different studies done by Esakkimuthu and Kameswari (2017), Verma *et al* (2018), and Singh *et al* (2021) in Tamil Nādu, Rajasthan, and Haryana are represented in Figs. 2, 3, and 4. Figure 2 shows that in all three states, most of those working in this profession are young people of ages ranging from 18 to >50 years. People beyond the age of 50 might be seen actively working in the state of Tamil Nādu. According to Figure 3, 197 of the 213 farmers in Tamil Nadu have marginal land, 15 have tiny land, and just one has semimedium land. Farmers in Rajasthan, on the other hand, have sought small and medium-sized tracts of land for this endeavor. The majority of farmers in Haryana work on marginal land, but medium- and small-scale farmers also contribute significantly. According to Figure 4, 183 beekeepers in Tamil Nādu earn less than Rs. 50,000 per year, 28 earn between Rs. 50,000 and Rs. 1,00,000 per year, and just two make more than Rs. 1,00,000 per year. In Rajasthan, 9 beekeepers earned a low level of income (less than Rs. 50,000 per annum), 6 earned a medium level of income (Rs. 50,000- 1,00,000 per annum), and 3 earned a high level of income (Rs. 1,00,000 and above per annum). In Haryana, 71 beekeepers have low income, 42 have medium income, and 6 have high income. In all of the states surveyed, the majority of farmers earn low wages, which could be because they are mostly small and marginal farmers.

Political analysis of apiculture

The Government of India has always shown a positive attitude towards developing apiculture in India, be it before independence through the recommendation of the Royal Commission on Agriculture for developing cottage industries or after independence. A number of institutes and schemes have been set up and launched by the Government of India to promote beekeeping in the country, and some of them are stated as follows. (i) The Khadi and Village Industries Commission (KVIC) set up in 1957 is making tremendous efforts in the development and promotion of khadi and village indus-

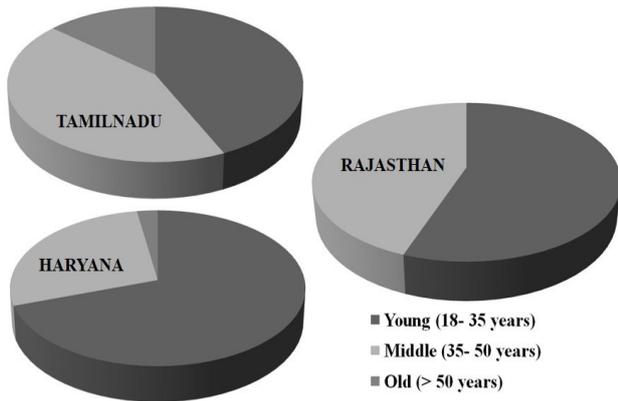


Fig. 2. Involvement of people of all ages in beekeeping in three Indian states

tries, including beekeeping, with the aim of uplifting the socioeconomic condition of people in rural and underdeveloped areas of the country. ii) The Central Bee Research and Training Institute (CBRTI) was set up in 1962 under the KVIC just to focus on the beekeeping sector. Here are some of the activities undertaken by CBRTI in the related field. It has designed 15 different training modules ranging from 2 hours to 6 months to conduct training programs for budding beekeepers. It studies bee biology and ethology to promote the culture of wild bees such as rock bees and dwarf bees. The institute studies the effect of bees on various crops when cultured in proximity with them (www.kvic.gov.in/). iii) The Tribal Cooperative Marketing Development Federation of India Ltd. (TRIFED), founded in 1984, is helping tribal people by imparting them knowledge related to beekeeping. The periodic trainings are conducted to keep beekeepers updated regarding the new technology with a motive to seed interest in those who are unemployed and are looking for employment opportunities (Agrawal, 2014). iv) The

National Bee Board established in the year 2000 has the responsibility to disseminate scientific knowledge regarding beekeeping to practitioners by conducting periodic trainings or through publications such as its magazine “Bee World”. It also has the duty to keep a record of active beekeepers in various regions of the country (nbb.gov.in; Srivastava, 2019).

There are different schemes launched by the government to aid the beekeepers financially, hence promoting beekeeping viz; i) Prime Minister's Employment Generation Programme (PMEGP), this scheme is implemented under KVIC and provides maximum assistance of Rs 25 lakhs in for projects in the manufacturing sector and around Rs 10 lakhs for projects in the service sector. Any individual above 18 years and with a minimum qualification until the 8th standard is eligible to apply for the benefits provided by the scheme (Srivastava, 2019). iii) The Mudra Loan Scheme was launched in 2015 by the Honble Prime Minister and aimed to provide financial assistance to micro and small enterprises and aspir young entrepreneurs to build and expand their businesses. The maximum aid provided under the scheme is 10 lakhs and is extended to beneficiaries under 3 categories: Shishu (credit up to 50,000), Kishore (credit from 50,001 to 5 lakh) and Tarun (credit from 5,00,001 to 10 lakhs). (3) Under the program, Nafed will help in setting up FPOs for beekeepers in five states: West Bengal, Bihar, Madhya Pradesh, Uttar Pradesh and Rajasthan (Nafed, 2020).

Economic analysis of apiculture

Honey production yields a net income of Rs 4, 24,168/- (approximately) for stationary beekeeping and Rs 10, 04,800/- (approximately) for migratory beekeeping for 100 bee colonies on the Indian subcontinent (Nath et al, 2019). India shipped 633.82 crore rupees of natural honey to the United States, Saudi Arabia, Canada and Qatar in 2019–20 if one is educated on the honey mar-

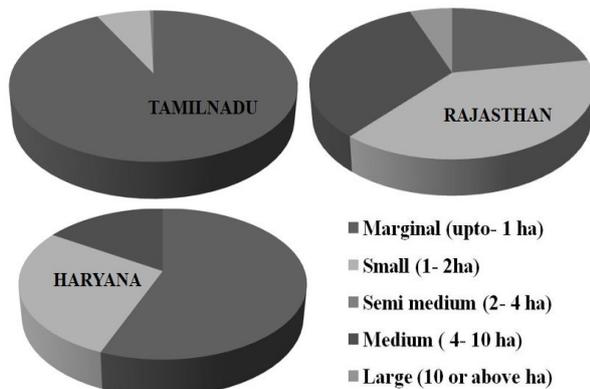


Fig. 3. Farmers in three Indian states have occupied beekeeping in various land holdings

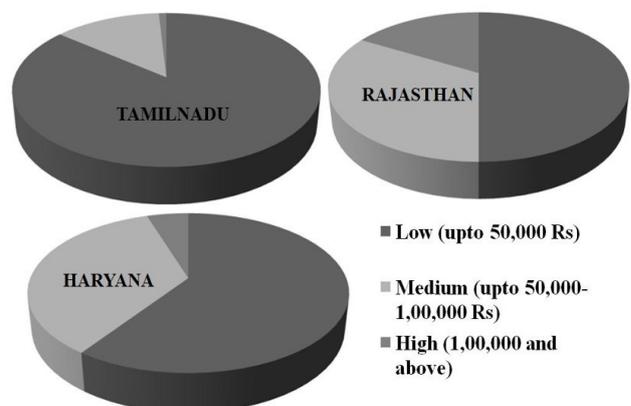


Fig. 4. Adoption of beekeeping by farmers in three Indian states with varying degrees of income

ket's size. It is estimated that the Indian honey market will reach Rs 33,128 million by 2024 (<https://www.niti.gov.in/honeyed-shot-arm-aatmanirbhar-bharat>), growing at a CAGR of approximately 12 percent (IMARC report), and that the global honey market, which was expected to be worth US\$8.6 billion in 2020, will grow to US\$11.2 billion (with a CAGR of 3.9%) by 2027 (despite the COVID-19 dilemma) (Research and Markets, 2021).

Social analysis of apiculture

Fig. 5 depicts the societal elements that have a negative impact on beekeeping adoption as an enterprise. Of the sample size taken, 47.6 percent of people prioritise other farm activities over beekeeping, 24.15 percent of people lack family support for adopting beekeeping as entrepreneurship, 8.2 percent of the people are not interested in practising beekeeping, and 44.9 percent of the people from the sample size taken lack land and resources required for practising beekeeping. Singh and Singh, 2019, Singh *et al.*, 2021; Asrani *et al.*, 2007 have all contributed to this conclusion. Factors that encourage people to start beekeeping businesses are depicted in Figure 6. Research conducted by Singh *et al.* (2021) shows that 96.6% of the sample size shows that adopting bee keeping requires a small amount of initial investment, 92.4% suggests that beekeeping is a less labor-intensive activity, 88.2% suggests that it requires less technical activity, 81.5% experiences a high return on expenditure, 48.7% became self-employed, and 31.1% received an additional source of income. There was no conflict with the major crop, there was no danger to cattle, and it took less time than other agricultural chores to maintain beehives (Jaiswal and Shaymrao, 2019). Beekeeping also does not need any formal schooling (Singh *et al.*, 2018).

Technological analysis of apiculture

Below are the technological tools that can help beekeepers keep their bee hives healthy. Modernized technology has made collecting data effective and easier for beekeepers to keep track of their apiaries and bee health (<https://www.fbfs.com/learning-center/5-modern-beekeeping-technologies>).

Hive tracks

Hive tracks are cloud-based software that helps digitally monitor changes such as population checks, behavioral patterns, brooding patterns and honey reserves in hives. This software can be used by both commercial and noncommercial beekeepers. Through this software, one can also click pictures, map where the bees are foraging and obtain a reminder about feed for bees and their timely inspection.

Thermosolar hive

Through this patented modernized technological tool, one can protect the hive from pest attacks that would otherwise require chemical treatments. This tool comprises a rooftop solar panel that regulates the hive's internal temperature, which is suitable for bees but is harmful to their pests, such as varroa mites. It is said that the thermosolar energy that is being regulated in the hive promotes colony expansion and honey collection by 75%.

Bee smart pollinator gardener

This application enables one to determine the plants that are friendly to bees. Browsing the plant database by light or soil requirements, bloom time, color or which pollinators they attract in this application makes the beekeeper selection process easier. This application gives free access to gardeners and beekeepers, which enables them to provide better and more forage to their colonies.

Flow hive

It enables beekeepers to harvest honey by turning a lever to start the flow, which means no more opening the hive to extract each frame and disturb your bees. A second-generation design, Flow Hive 2, includes small design tweaks such as a harvesting shelf to hold honey jars.

Buzz box

This is a smart bee management system that helps beekeepers track anything from a distance apart. It consists of a small sensor called the buzz box mini hive health monitor that works on artificial intelligence (AI). It is attached to one side of the hivebox and thus monitors the sound of the bees, temperature, humidity and pressure inside the bee boxes. It can also detect issues such as missing the queen from the hive, swarming and parasite attack in the colonies. If any issues are detected, alerts are received to the operators via its smartphone application.

Products from apiculture

Honey, beeswax, bee venom, royal jelly, and propolis are the major products of this industry. Honey is a sugary substance made by bees and other kinds of insects. It is mainly used as a dietary product when used as a sweetener; it possesses appealing chemical qualities for baking and a distinct flavour. Honey is mostly composed of carbohydrates, but it also contains small amounts of acids, minerals, vitamins, enzymes, and antibacterial compounds. Honey is mainly classified according to the source from which bees extract their sweet liquid, whether it is from a flower or not and if it is from a flower, then which kind of flower, etc. (Rahman,

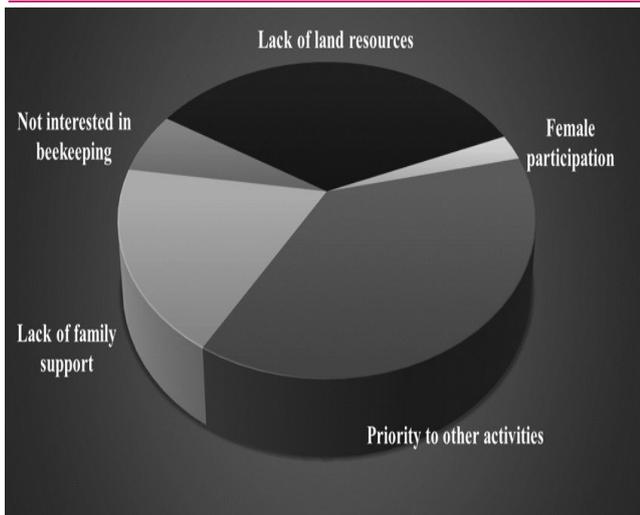


Fig. 5. Social factors negatively affect beekeeping adoption as entrepreneurship

2017). The type of honey also varies according to the species of honey bee used for preparing it. One kilogram of honey usually fetches approximately 350 INR and can even go up high based on its kind and demand in the market (<https://www.amazon.in/Honey/b?ie=UTF8&node=4860158031>). Bee wax is generated naturally by honey bees of the genus *Apis* with the help of the wax-producing gland present in their abdominal region. Being natural and nontoxic, it has its functions in many areas, such as in cosmetics, pharmaceuticals, and the perfume business (Nath *et al.*, 2019). The cost of 100 g of bee wax is approximately 200 INR and can increase according to the quality. Bee venom costs approximately 10000 to 12000 INR per gm in the market (Indian express, 2014). It is basically a kind of poison stored in the poison sac of worker bees to help them protect their hive and food stores. Due to its various medical advantages, it serves as a great product for mankind as well (Nath *et al.*, 2019). Royal jelly is basically a kind of dish secreted by the hypopharyngeal glands of the nurse bee served to larvae and to the adult queen for their proper growth and development. It exhibits various pharmacological properties, such as antitumour and antioxidative anti-fatigue properties (Srivastava, 2019). Thirty capsules of approximately 1000 mg of royal jelly extract can cost approximately 1411 INR on the market. Propolis is a sticky substance produced when honey bees mix saliva and bee wax with the emission of trees and other botanical sources (Nath *et al.*, 2019), and 1 kg of propolis costs approximately 4000 Rs (<https://www.amazon.in/Honey/b?ie=UTF8&node=4860158031>).

SWOT analysis of apiculture

Conducting a SWOT analysis is key to identifying strengths, weaknesses, opportunities, and threats, which further helps to better understand the pros and

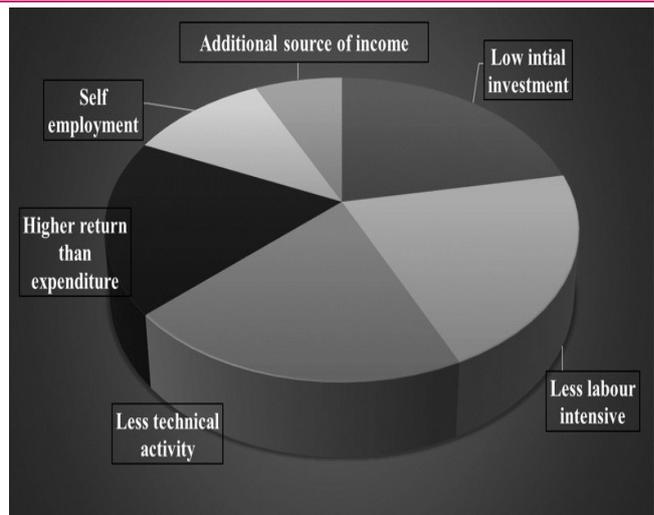


Fig. 6. Social factors that positively affect beekeeping adoption as entrepreneurship

cons of a particular business (Figure 7). The strengths, limitations, possibilities, and dangers in the field of beekeeping were examined in this study. SWOT analyses would help to improve weaknesses and mitigate threats found in beekeeping.

STRENGTHS

The inexpensive initial investment required to start beekeeping is one of the crucial factors that motivates farmers to adopt it (Singh *et al.*, 2021). The land area required for beekeeping is extremely limited; hence, farmers with no or limited land mass can also undertake this activity, as the apiaries are preserved on the boundaries rather than in cultivable areas, there is no agriculture and they are wasted as well (Agrawal, 2014). As stated above, this sector currently employs 2,50,000 farmers, making it an outstanding source of work for the unemployed in rural areas. Beekeeping includes fewer technicalities than other agricultural fields (Singh *et al.*, 2021), which reduces the training period to a great extent. After completion of training, processing of honey can be carried out on a small scale with basic equipment by the keepers. Bees are excellent pollinators and take up beekeeping, and some crop yields can be increased by up to 200 percent in adjacent areas (Agrawal, 2014). The Indian government has launched many schemes to help people undertake beekeeping, some of which have already been stated in the political analysis of PEST analysis, and training programmes are being launched periodically by government institutes such as that KVK to help people undertake the activity (Verma *et al.*, 2018). Interestingly, adopting bee keeping would also help you to take care of your health, as both consuming honey regularly and bee stings have proven to be highly beneficial for health (Ghosh, 1994).

WEAKNESS

Skilled labor and equipment

There are many people who are unable to establish a beekeeping business because of a scarcity of skilled workers and high-quality equipment (Singh *et al.*, 2021). *Quality testing facilities:* In India, beekeepers and packers do not have easy access to quality testing facilities, and any infrastructure for disease surveillance is also absent in India, which makes it difficult for India honey to be accepted by the European market (Agrawal, 2014). *Absence of assembled marketing structure:* Due to a lack of marketing facilities and transportation choices, beekeepers must rely on intermediaries to sell their produce on the market, incurring significant losses (Nath *et al.*, 2019). *Lack of genuine pricing:* The price of apicultural products varies from time to time; it is neither stable nor constant, and the presence of middlemen in the chain acts as a cherry on the cake, as this makes farmers sell their produce at very low prices to middlemen, who in turn sell the same product at a very high rate in the market, earning huge benefits (Nath *et al.*, 2019). *Bee doctors:* Although it is simple to train it to tame bees and harvest honey, it is more difficult to instruct all beekeepers on bee diseases. Because bee doctors are not present everywhere for prevention or treatment, an epidemic can quickly wipe out the whole bee population. *Bee flora:* There is very limited information about the flora available to feed bees for honey production, as feeding harmful flora to bees may fetch beekeepers with honey that may prove harmful to health (Ghosh, 1994).

OPPORTUNITIES

The following discussion has been concluded from the research done by Agrawal (2014). The honey industry

in India can become a major foreign exchange earner sector if international market standards are met. Beekeeping is an age-old tradition in India and is considered a no-investment profit-giving venture in most regions. Recently, it has been observed that it can grow as a prime agri-horticultural and forest-based industry. As it is a lucrative business, employment can be generated through it. The informal sector has provided approximately 70% of the honey and bee wax market in India. With modern techniques for collection, storage, beekeeping equipment, honey processing plants and bottling technologies, Indian honey has become a good product for export markets. To increase foreign trade, Indian honey, which is a good product in the international market, needs to be examined for suitable export strategies. These include using more advanced technology at the commercial level for collecting and processing honey, strictly adhering to international market quality standards, recognising beekeeping as an agro-industry, and raising concerns about Indian honey quality in the international market. Beekeeping may be combined with aquaponics in a variety of ways (Augustin *et al.*, 2020). Additionally, the world market commands approximately one million tons of honey, which generates a chance for India to raise its export share from 7,000 tons to three lakh tons. Farmers with fewer financial resources or managerial backgrounds could practice small enterprises, which would help boost the entrepreneurial base in the country and thus enhance their income. Agro-based industries provide an excellent opportunity to farmers for local entrepreneurship and employment generation, thus improving their socioeconomic conditions and adopting bee keeping, as entrepreneurship enhances increased honey production, pollination and thus employment (Fuad *et al.*, 2019). The apiculture market is estimated to register a CAGR of 4.3% during the period 2020–25, with

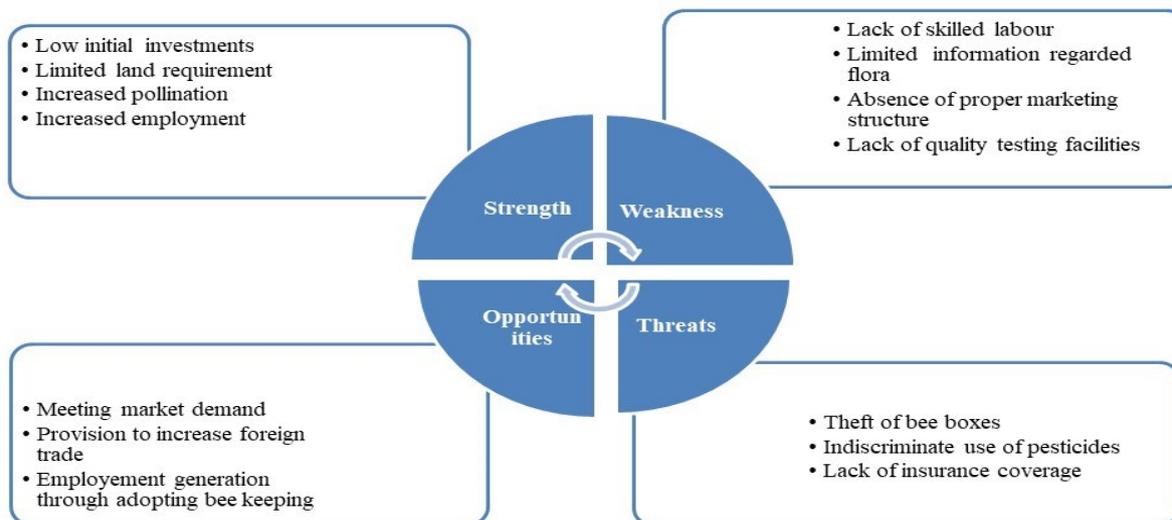


Fig. 7. Overview of SWOT analysis of Beekeeping

Asia-Pacific as the dominant producer (<https://www.niti.gov.in/honeyed-shot-arm-aatmanirbhar-bharat>).

THREATS

Among different threats, theft of bee boxes was reported as the major problem in bee keeping, as these boxes are kept in open space and keeping an eye on them all the time is not possible. Not only boxes but also the expensive tools and equipment that are being used are theft. Another problem that beekeepers are facing is a lack of Insurance Coverage. No insurance coverage to beekeepers for their bee boxes and tools used. Additionally, the bee keepers are not aware of the currently working policies for bee keeping. Demanding new policies and insurance cover for their boxes and equipment for security and financial backbone is of prior concern otherwise, which would prevent them from adopting bee keeping. Beekeepers are facing problems in the migration of honey bee colonies: moving bee boxes to different places might help bee keepers increase honey production, as new places have different flora, which would help bees produce more but beekeepers face heavy transportation charges for moving their bee boxes to different places. Additionally, bees die while transporting, which results in their colony destruction. Additionally, the police ask them for bribes while transporting. All these factors eventually demotivate bee keepers. The overuse of pesticides and fertilisers on farms is causing the population of bees to decline (Bonmatin *et al.*, 2015; Doublet *et al.*, 2015; Chaudhary *et al.*, 2021). Mobile tower radiation is harmful: We learned through our exchanges with farmers that the number of bee colonies has decreased in recent years. One reason, in particular, an increase in the number of mobile towers in and around their location, is one of the factors contributing to the decline in bee population. Bees are distracted by mobile tower radiation, which leads to the loss of bee species. According to research, the "navigational skills" of worker bees that go out to collect nectar from flowers to support bee colonies are harmed by electromagnetic radiation from mobile towers and cell phones (Santhosh Kumar, 2018). Adopters were found to lack knowledge regarding government assistance for beekeeping, such as the national bee board, which is supported by the Ministry of Agriculture, Government of India (Gupta *et al.*, 2015). In addition, beekeepers are not registering with the bee board. This would make it easier for them to move bee boxes over long distances. They can also receive training in beekeeping. SWOT analyses thus conducted would help to improve weaknesses and mitigate threats found in beekeeping.

Conclusion

Beekeeping is a growing field in agriculture that is

worth investing in since it has high-profit margins and requires little monetary input. Anyone may perform it, regardless of age, prior knowledge, or land availability. This industry offers a wide range of products, and the statistics stated only point to an increase in global demand for bee products in the near future. The Indian government has also been supportive of apiculture, offering financial and other assistance to beekeepers, as seen in PEST analysis. From the SWOT analysis, it can be inferred that the strengths and opportunities of bee keeping stand unequivocally on the higher side than the weaknesses and threats, making it one of the most susceptible enterprises for agripreneuers. India's beekeeping sector currently employs 2,50,000 farmers, making it an outstanding source of work for the unemployed in rural areas. Adopting bee keeping would also help you to take care of your health, as consuming honey regularly and bee stings have proven to be highly beneficial for health. The honey industry in India can become a major foreign exchange earner sector if international market standards are met. As it is a lucrative business, employment can be generated through it. With modern techniques for collection, storage, beekeeping equipment, honey processing plants and bottling technologies, Indian honey has become a good product for export markets.

Conflict of interest

The authors declare that they have no conflict of interest.

REFERENCES

1. Agrawal, T. J. (2014). Beekeeping industry in India: Future potential, *International Journal of Research in Applied, Natural and Social Sciences*, 2(7), 133-40
2. Anandhy, A. & Beula, K. (2019). A Study on Prospects and Potential of Beekeeping Entrepreneurship Development in India, *Kamaraj Journal of Academic Research*, 28 (4), 411-424.
3. Asrani, S., Kaushik, S., Sharma, S. K. & Kaushik, H. D., (2007). Prospects of beekeeping in Haryana: Perceived needs, constraints and enablers, *Journal of Dairying, Foods and Home Sciences*, 26(1), 48-53.
4. Augustin, C. L., Muntenita, C., Plenovici, C. P. & Zugravu, G. A. (2020). Environmental risk assessment of intensive beekeeping integrated with aquaponic system, *Journal of Engineering and Science Research*, 4(2), 01-04.
5. Bonmatin, J. M., Giorio, C., Girolami, V., Goulson, D., Kreuzweiser, D. P., Krupke, C., *et al.* (2015). Environmental fate and exposure; neonicotinoids and fipronil. *Environ. Sci. Pollut. Res. Int.*, 22, 35–67. doi: 10.1007/s11356-014-3332-7
6. Chaudhary, A., Kumari, S., Kumari, P. & Gupta, G. (2021). Management of pesticides to avoid exposure to bees and other pollinators. *Canadian Journal of Agricultural and Applied Sciences*, 1(1), 9-15. DOI: 10.5281/zenodo.6037714

7. Doublet, V., Labarussias, M., de Miranda, J. R., Moritz, R. F. A., & Paxton, R. J. (2015). Bees under stress: sublethal doses of a neonicotinoid pesticide and pathogens interact to elevate honey bee mortality across the life cycle. *Environ. Microbiol.*, 17, 969–983. doi: 10.1111/1462-2920.12426
8. Economic Survey of Haryana (2020-2021). Economic Survey of Haryana. Department of Economic and Statistical Analysis, Haryana. Retrieved from <http://web1.hry.nic.in/budget/Esurvey.pdf>
9. Economic survey of Himachal Pradesh (2020-2021). Economic Survey of Himachal Pradesh. Department of Economic and Statistical Analysis, HP. Retrieved from https://himachalservices.nic.in/economics/pdf/Economic_Survey_eng2020-21.pdf
10. Economic Survey of Punjab, (2000). Economic Survey of Haryana. Department of Economic and Statistical Analysis, Punjab. Retrieved from <http://14.139.60.153/bitstream/123456789/6805/1/Economic%20Survey%20of%20Punjab%202000-01-D11040.pdf>
11. Esakkimuthu, M. & Kameswari, V. L. (2017). Entrepreneurial potential of small scale beekeeping in rural India: a case in Kanniyakumari district, *Tamil Nadu. Tropical Agricultural Research*, 28(4), 411 – 424.
12. Fuad, M. A., Nurhasan, M. & Kayess, M. O. (2019) Potentials and Prospects of Beekeeping Entrepreneurship in Dinajpur Region: A Participatory Analysis. *Agricultural Research and Technology Open Access Journal*, 21(5), 556178.
13. Ghosh, G. K. (1994) Beekeeping in India, *Ashish Publishing House*, 194pp.
14. Gupta, S., Sachdeva, K. & Kushwaha, R. (2015). Beekeeping in Haryana and Uttar Pradesh: A comparative study, *DU Journal of Undergraduate Research and Innovation*, 1(2), 365-373.
15. IBEF Presentation (2019-20). India Brand Equity Foundation. Retrieved from <https://www.ibef.org/download/Punjab-March-2021.pdf>
16. Indian Express, (2014), More than just honey. Retrieved from <https://indianexpress.com/article/cities/chandigarh/more-than-just-honey/> (visited on 6-Sept, 2021)
17. Jaiswal, D. K. & Shaymrao, I. D. (2019). Honey and Beekeeping: Tool for Quantum Jump, *Agrobios Newsletter Introduction to Agricultural Botany*, 17(11), 108- 109.
18. Krishi Jagran (2021). Haryana Bee Keeping Policy How It Will Help Farmers. <https://krishijagran.com/agriculture-world/haryana-bee-keeping-policy-2021-how-it-will-help-farmers/>
19. Monga, K. & Manocha, A. (2011). Adoption and constraints of beekeeping in district Panchkula (Haryana). *Livestock Res. for Rural Dev.* 23, Article #103, from <http://www.lrrd.org/lrrd23/5/mong23103.htm>.
20. Nafed (2020). Agriculture ministry unveils Nafed's honey FPOs programme for 5 states https://economictimes.indiatimes.com/news/economy/agriculture/agriculture-ministry-unveils-nafeds-honey-fpos-programme-for-5-states/articleshow/79430483.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
21. Nath, A. K., Thakur, M. & Sharma, S. K. (2019). Beekeeping as an Entrepreneurship, *Lupine Publishers*, 7(4), 1017-1019. <http://dx.doi.org/10.32474/CIACR.2019.07.000270>
22. PIB Delhi, (2022). Ministry of Commerce & Industry <https://pib.gov.in/PressReleasePage.aspx?PRID=1787763>
23. Popa, A. A., Mărghițaș, L. A., Arion, F. H., & Pocol, C. B. (2012). Entrepreneurial behavior in the beekeeping sector as determinant of sustainable development. *Anale Universității din Oradea, Fascicula Ecotoxicologie, Zootehnie și Tehnologii de Industrie Alimentară*. XI (A), 131-140.
24. Popa, A., Marghitas, L., & Pocol, C. (2011). A Complex Model of Factors that Influence Entrepreneurship in the Beekeeping Sector. *Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Horticulture*, 68(2). doi:<http://dx.doi.org/10.15835/buasvmcn-hort:7107>
25. Rahman, A. (2017). Apiculture in India, Directorate of Knowledge Management in Agriculture Indian Council of Agricultural Research, 266. https://ia802806.us.archive.org/18/items/picultureinindi0000atua/apicultureini_ndi0000atua.pdf Research and Markets, (2021). https://www.researchandmarkets.com/reports/1206739/honey_global_market_trajectory_and_analytics (visited on 4 Oct, 2021)
26. Santhosh Kumar, S. (2018). Colony Collapse Disorder (CCD) in Honey Bees Caused by EMF Radiation. *Bioinformation*. 14(9),421-424. doi:10.6026/97320630014521
27. Singh, B, Singh, S & Batra, (2018). A Socioeconomic status of the people adopting beekeeping as an entrepreneurship, *International Journal Current Microbiology and Applied Science*, 7(07), 143-149.
28. Singh, B. & Singh, S. (2019). Perception towards adoption and constraints in beekeeping, *Journal of Pharmacognosy and Phytochemistry*, 8(5), 459-461.
29. Singh, B., Singh, S., Kumar, N. & Kumar, D. (2021). Adoption of beekeeping as an enterprise in Haryana, *Journal of Entomology and Zoology Studies*, 9(3), 348-351.
30. Singh, G., Tiwari, D. & Yadav, S. P. (2016). Income enhancement and employment generation through apiculture enterprise for rural youth in Punjab. *Indian Res. J. Ext. Edu.* 16(1): 112-115.
31. Singh, R. (2021). Current Honey Market in India -Volume and Value. *International Journal of Ayurveda and Pharma Research*, 9(8):82-88. <https://doi.org/10.47070/ijapr.v9i8.2050>
32. Srivastava, P. (2019). Status report of beekeeping and honey processing. <http://msmedikanpur.gov.in/cmdatahien/reports/diffIndustries/Status%20Report%20on%20Bee%20keeping%20&%20Honey%20Processing%202019-2020.pdf>
33. Verma, T. C., Meena, K. C., Aswal, S. & Singh, D.K. (2018). Sociopersonal and economic analysis of apiculture enterprise in Hadaoti region of Rajasthan, *Economic Affairs*, 63(1), 261-268. DOI: 10.30954/0424-2513.2018.00150.32