

Report of the

**BEEKEEPING
DEVELOPMENT
COMMITTEE**



**Economic Advisory Council to the Prime Minister
Government of India**

June 2019

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LIST OF ABBREVIATIONS

	Abbreviations	Expansions
1.	AICRP (HB & P)	All India Coordinated Research Project on Honey Bees and Pollinators
2.	BDC	Beekeeping Development Committee
3.	BIS	Bureau of Indian Standards
4.	CAU	Central Agricultural University
5.	CBRTI	Central Bee Research and Training Institute
6.	CSO	Central Statistics Office
7.	DAC&FW	Department of Agriculture Cooperation and Farmers' Welfare
8.	DARE	Department of Agricultural Research and Education
9.	EAC-PM	Economic Advisory Council to the Prime Minister
10.	FPI	Food Processing Industries
11.	FPO	Farmer Producer Organisation
12.	FSDF	Farm Sector Development Fund
13.	FSSAI	Food Safety and Standards Authority of India
14.	FST	Food Science & Technology
15.	GoI	Government of India
16.	HPBI	Honey and Pollinators Board of India
17.	ICAR	Indian Council of Agricultural Research
18.	IIHBPR	Indian Institute of Honey bees and Pollinators Research
19.	KVIB	Khadi and Village Industries Board
20.	KVIC	Khadi and Village Industries Commission
21.	MIDH	Mission for Integrated Development of Horticulture
22.	MoA&FW	Ministry of Agriculture and Farmers' Welfare
23.	MoC&I	Ministry of Commerce and Industry
24.	MoEF&CC	Ministry of Environment, Forestry and Climate Change

25.	MoFPI	Ministry of Food Processing Industries
26.	MoH&FW	Ministry of Health and Family Welfare
27.	MOMSME	Ministry of Micro Small and Medium Enterprises
28.	NABARD	National Bank for Agriculture and Rural Development
29.	NAD	National Accounts Division
30.	NIFTEM	National Institute of Food Technology Entrepreneurship and Management
31.	NBB	National Bee Board
32.	NGO	Non Governmental organisation
33.	NHM	National Horticultural Mission
34.	PAU	Punjab Agricultural University
35.	SDG	Sustainable Development Goals
36.	SDH	State Department of Horticulture
37.	SFD	State Forest Department
38.	SHG	Self-Help Group
39.	SKUAST	Sher-e-Kashmir University of Agriculture Science and Technology
40.	SKUAST-K	Sher-e-Kashmir University of Agriculture Science and Technology for Kashmir
41.	TNAU	Tamil Nadu Agricultural University
42.	UNDP	United Nations Development Programme

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OBJECTIVES FOR CONSTITUTING BEEKEEPING DEVELOPMENT COMMITTEE BY EAC-PM

- i. To improve agricultural productivity through planned pollination with honey bees
- ii. To enhance employment generation and rural development through beekeeping
- iii. To provide nutritional security to resource-poor Indian public and farmers by increasing crop productivity
- iv. To enhance biodiversity and environmental sustainability through honey bees

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I am happy to bring out this Report of the Beekeeping Development Committee (BDC) of the Economic Advisory Council to the Prime Minister (EAC-PM). EAC-PM set up the BDC under my Chairmanship in which, among others, Shri Ratan P. Watal, Member Secretary and Shri K. Rajeswara Rao, Advisor, EAC-PM were also the Members. The BDC consulted various stakeholders, reviewed the status of beekeeping in India and recommended suitable measures in this Report for improvement of beekeeping and crop pollination in India.

2. I express my sincere thanks to all the Members of the BDC and its Sub-Committees: 1 & 2 for their active participation in the deliberations and providing insight into the issues and possible solutions for development of beekeeping in the country. My special thanks to the Conveners of the Sub-Committees (Dr. M.R. Srinivasan, Professor of Entomology, TNAU, Coimbatore and Dr. B.N.S. Murthy, Horticulture Commissioner, DAC&FW / Dr. B.L. Sarswat, Executive Director, National Bee Board, DAC&FW) and Dr. V.V. Ramamurthy, Retired Professor, IARI for their active role in convening and contributing to the conduct of the meetings.

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(Dr. Bibek Debroy)



EXECUTIVE SUMMARY

1. Beekeeping is an important activity that supplements and compliments agriculture and provides nutritional and economic security to rural communities worldwide. Even landless people can take up beekeeping as a profession. Beekeeping helps in generating additional income and is an integral part of integrated farming system. In addition to the revenue obtained from honey and other bee products, pollination activities of honey bees are important which contribute to the increased crop yield to an extent of 20-80 per cent in most of the cultivated crops through cross pollination. Beekeeping aids in increased agricultural productivity, has role in employment generation, rural development and nutritional security and is crucial in maintaining biodiversity and provides environmental sustainability. Thus beekeeping provides multiple advantages.
2. India is a country which inhabits four major honey bee species; two domesticated species, viz. *Apis cerana* (Indian or Asian honey bee) and *A. mellifera* (European honey bee) and two wild species, viz. *A. dorsata* (rock honey bee) and *A. florea* (dwarf honey bee). Beekeepers in many of the Indian States including Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Telengana, Odisha and North Eastern States, cultivate *A. cerana*, Indian honey bee and are dependent on it for their livelihood. The honey obtained from *A. cerana* constitutes hardly 5 to 10% of total honey produced in India.
3. Among the four species, *A. mellifera* is an introduced species to India. *A. mellifera ligustica* known as the Italian bee was introduced into India in the 20th century when the beekeeping industry with the native bee, *A. cerana* was badly hit because of the outbreak of tracheal mite, *Acarapis woodi* and Thai sacbrood virus during 1965-1986. Presently beekeeping with *A. mellifera* is more in North India because of the rich flora viz., Mustard, Sunflower, Eucalyptus, Safflower, etc. They produce 50 to 60 kg of honey per colony per year. About 70-75% of the honey produced in India is from *A. mellifera*. Placing a few hives in the vicinity of the cropped area helps in large number of honey bees working in a society and accomplishing crop pollination sufficient to produce seeds and fruits that man consumes in his daily life.
4. *A. dorsata*, rock bee contributes to approximately 20% of the total honey produced in India, even though there is no clear official estimate available. The quantity of honey that is taken from little honey bees *A. florea* is negligible. However all the honey bee species are important pollinators and need to be conserved.

5. The stingless bees which are non *Apis* bees classified under Meliponini of family Apidae are important pollinators of various food crops, and they can be domesticated. The honey yield per hive per year is very low, approximately 100 to 750 g per hive per year depending upon locations, however the honey fetches a very high price of Rs.2000 to 3000 per kg for its medicinal value in traditional Indian medicine.
6. The best known primary products of beekeeping are honey and wax, but pollen, propolis, royal jelly and bee venom are also marketable primary bee products. Honey is commonly referred as golden liquid because of its unrivaled properties. Royal jelly is sold at very high prices in international market as dry powder in capsules or as formulation with honey. Commercial production of royal jelly is restricted to *A. mellifera* in India and that too by a very few beekeepers. Bee collected pollen is the chief source of protein, lipids, amino acids, minerals, vitamins etc. in the honey bee diet. Pollen is also considered as a complete food for human beings. Bee pollen is sold in market for prices ranging from Rs. 2000 to 20000 per kg depending on the crop from which it is collected by bees. There is vast scope for increasing its production based on demand in local and international market. The bees wax is used in several industries such as cosmetic, electric and textile industry, church candles, carbon paper, metal castings and mouldings and shoe polish. Bee venom has a history of healing back pain, musculoskeletal pain, and skin diseases. Quantity of bee venom produced by worker bees vary between 100 to 150 μ g.
7. A bee hive is a wooden box in which a honey bee colony is kept and reared for the purpose of honey extraction and crop pollination. The bee hive is designed taking into account the natural habitat and place of living of honey bees. It has various parts namely hive stand, floor board, brood chamber, super chamber, brood and super frames, inner cover and outer cover. In addition to a hive, many other beekeeping accessories and safety gears are being used while handling honey bees.
8. In 2017-18, China ranked first in honey production with 551 thousand tonnes while India ranked eighth among the world countries with 64.9 thousand tonnes. China ranked first in exports with 131.6 thousand tonnes while India ranked fifth with 35.8 thousand tonnes as per FAOSTAT. However the data available with NBB, MoA&FW indicates that the volume of export of honey has increased from 29.6 to 51.5 thousand tonnes between 2014-15 and 2017-18. The value of honey export was about Rs.6500 crores during 2017-18. The domestic consumption of honey has remained more or less stable around 50 thousand tonnes during the last four years (NBB Data). The honey consumption in kg/capita/year was highest in European nations (more than 1.0) followed by USA (0.67) and only 0.02 in India (FAOSTAT, 2017-18).
9. Based on the area under cultivation in India and bee forage crops, India has a potential to have about 200 million bee colonies while the current figure is about 3.4 million colonies. Increasing the number of colonies not only increases honey production, but also substantially boosts the productivity of agricultural and horticultural crops.
10. Migratory beekeeping provides good returns to the beekeeper as the returning bees to the hive are maximum, because of abundant flora in that region. For doing commercial migratory beekeeping, the beekeeper has to map the floral resources available and do planned migration accordingly. Honey bees are affected by a large number of diseases

caused by viral, bacterial, fungal, protozoan organisms, ecto- and endo-parasitic mites, birds, insects and higher animals. The extent of losses may vary based on severity of infection or infestation, and may lead to decline in honey production or loss of bee colony all together. It is essential to detect the pests and diseases at initial stages for better management.

11. In India, there are multiple ministries and departments associated with beekeeping. The ICAR, DARE, MoA&FW, Government of India assisted by SAUs is involved in research on beekeeping and its role in cross pollination and crop productivity increase. The NBB, MoA&FW promotes scientific beekeeping for pollination support under MIDH, register bee colonies / beekeepers and implementing IBDCs and other activities / programmes across the States. The KVIC in the MoMSME, GoI considers beekeeping as a Forest based industry and is involved in developing beekeeping mainly for honey. The FSSAI under MoH&FW makes standards for honey and bee products and implements it. APEDA, MoC&I, GoI deals with export of honey. Multiplicity of agencies involved in beekeeping development in India has led to lack of convergence and duplicity of efforts. Hence the EAC-PM of GoI decided to streamline the beekeeping activities in the nation.
12. In spite of the involvement of many agencies, the outcome is not commensurate in achieving sweet revolution for food, nutritional and livelihood security through beekeeping. Moreover, a recent UN report warns that globally about 40% of the insect pollinators are facing extinction that can directly affect food production and nutritional security. Hence, there is a need for an Apex Body like the EAC-PM to take lead in promoting and coordinating activities involved in beekeeping industry so that “Sweet/Golden Revolution” in the country could be achieved and crop yield can be increased leading to fulfillment of the attempt of Government of India in doubling farmers income by 2022. In this regard, it was decided to constitute “Beekeeping Development Committee” under the Chairmanship of Dr Bibek Debroy, Chairman, EAC-PM. The terms of reference of the Beekeeping Development Committee are given in Chapter 7. During its first meeting held on 6th June 2018, this committee decided to set up two Sub-Committees. In total, eight stakeholder consultation meetings were conducted in various locations namely Delhi, Coimbatore, Ramnagar (Haryana), Imphal, Pune, Srinagar, Andhra Pradesh and Odisha to cover different regions of India, six of Sub-Committee: 1 and two of Sub-Committee: 2 were held.
13. The constraints faced by the stakeholders in beekeeping in India were listed out and recommendations for overcoming the constraints were prepared. The following are the crux of the recommendations.
 - i. Honey bees shall be recognized as an input in agriculture to ensure high level of crop productivity and food security and prevent pollinator decline. Beekeeper shall be considered farmer even if he is landless and government financial support meant for farmers shall reach him. Plantation of bee friendly flora shall be done on road sides/ railway lands/ banks of rivers/ waste lands/ forest, public lands, etc and women self-help groups shall be engaged in planting and maintaining the flora.
 - ii. Institutionalising NBB and rechristening it as Honey and Pollinators Board of India (HPBI) under the MoA&FW, by establishing a full-fledged authority/agency to synchronise the efforts of multiple agencies for overall development of apiculture in the country. More IBDC centres shall be funded by HPBI by identifying locations

with beekeeping potential. Existing IBDCs shall be strengthened. Scientific data on number of beekeepers and bee colonies in India shall be recorded through registration of beekeepers at their doorstep. The beekeepers shall be organized into effective entities such as Beekeepers' Federations or Farmer Producer Organizations (FPOs) like IFFCO for managing their inputs & equipments and marketing their produce. A honey price stabilization fund with Rs. 200 crore shall be made by the government of India which can support farmers during uncertain price situation. Honey (and bee products) sold in India or exported shall be traceable to a registered beekeeper or a registered collector (in case of rock bee honey) to prevent adulteration and sale of fake honey. Availability of standard bee hives and live bee colonies with superior queens and disease free condition shall be ensured to farmers and beekeepers. An independent organization or a learned society shall be engaged in the monitoring and evaluation of projects implemented.

- iii. ICAR shall upgrade its project coordinating Unit of AICRP on Honey bees and Pollinators, New Delhi to Indian Institute of Honey Bees and Pollinators Research (IIHBPR), New Delhi and shall continue to lead research on beekeeping. Apiculture as a subject shall be recognized by ICAR and it shall formulate syllabus for Masters Degree and Ph.D. degree programmes. ASRB, MoA&FW shall recognize apiculture subject for conducting ARS and NET exams and recruit specialists in apiculture. ICAR through its KVKs and centres in SAUs shall enhance providing periodical training to the beekeeping trainers.
- iv. The KVIC under MoMSME and KVIB under state governments shall synchronise activities with HPBI and register beekeepers and train them. State-wise and region-wise floral calendar shall be prepared by CBRTI and shared for the benefit of beekeepers and scientists.
- v. FSSAI shall notify standards and specifications for honey and all other hive products produced by different honey bee species. Storage, processing and marketing infrastructure from regional to national level for honey and other hive products to be ensured by HBPI and FSSAI. Quality testing labs for honey and other hive products shall be set up at regional and state-level and major beekeeping hubs.
- vi. Beekeepers shall be protected from facing hardship at state borders and highways from police and other officials during migration of bee colonies. Forest Department shall not stop beekeepers from selling honey or beeswax produced from domesticated hive bees for which amendment of Indian Forest Act, 1927 is recommended.
- vii. APEDA, MoC&I shall help in export of honey with simplified procedures including honey from native bee species by forming export promotion council on honey and bee products. Honey and bee pollen shall be included in mid day meals and child nutrition programmes, sportspersons and defense personnel considering the health benefits of consuming honey with the support of National Institute of Nutrition, Hyderabad.



CHAPTER 1

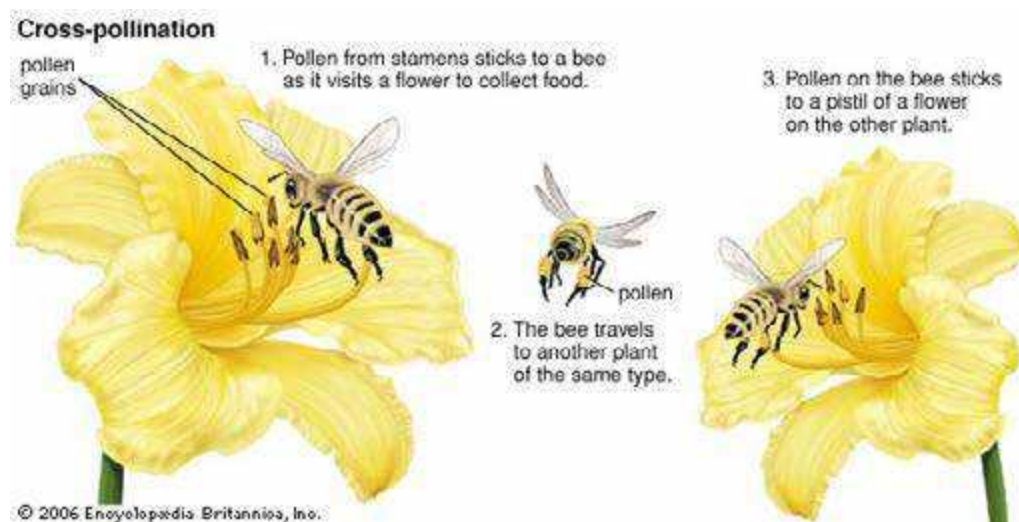
BEEKEEPING AND ITS BENEFITS

- 1.1 Honey bees are one of the nature's most exciting creations that help man in more than one ways. It provides the ever liked sweet substance - the honey. Bees produce honey from the sugary secretions of plants (floral nectar) or from secretions of other insects (such as honeydew), by regurgitation, enzymatic activity, and water evaporation. Bees store honey in wax structures called honeycombs. Man understood the technique of domesticating the bees and rearing them in hives around 200 years ago. Since then he has made innovations in its rearing techniques. India is gifted with wide diversity of flora and fauna and is one of the mega-biodiversity centres of the world.
- 1.2 Beekeeping is an important ancillary activity in agriculture which provides nutritional and economic security to rural communities worldwide. It is not a land-based activity and even landless people can take up beekeeping as a profession. Beekeeping helps in generating subsidiary income and forms a component of integrated farming system. In addition to the revenue obtained from honey and other bee products, pollination activities of honeybees are important which contribute to the increased crop yield per given land area. This can have double advantage, one is that honey production can be increased, the second one which is more important than the first one is that keeping bees can increase crop yield to an extent of 20-80 per cent in most of the cultivated crops through cross pollination.

A. ROLE OF BEEKEEPING IN AGRICULTURE

- 1.3 Honey bees travel from flower to flower, collecting nectar and pollen grains. The nectar thus collected is stored in combs and later converted into honey. The bee collects the pollen by rubbing against the anthers. The pollen collects on the hind legs, in a structure called "pollen basket". As the bee flies from flower to flower, some of the pollen grains are transferred onto the stigma of other flowers. Nectar provides the energy for bee nutrition; pollen provides the protein. When bees are rearing large quantities of brood, bees deliberately gather pollen to meet the nutritional needs of the brood. Good pollination management seeks to have bees in a "building" state during the bloom period of the crop, thus requiring them to gather pollen, and making them more efficient pollinators.
- 1.4 Pollination is essential for the production of fruit and seed. There are many plants that cannot produce fruit and seed if pollinated by their own pollen and so require cross

pollination. Such plants include those in which male and female parts are either borne on separate plants or on separate parts/flowers of the same plant. Cross-pollination is also essential in those crops in which male and female parts are borne on the same flower but they are physically excluded from each other.



The process of cross pollination

- 1.5 Honey bees, birds, bats and insects are important in pollination of most fruits and vegetables. Over 90% of all flowering plants and over three-quarters of the crop plants rely on animals for pollination. The crops benefited by bee pollination are: oilseeds (mustard, rape seed, toria, lahi, safflower, sunflower, etc.), orchard crops (apple varieties, pears, plums, cherry, strawberry, raspberry, persimmon, litchi, citrus, grapes, cucumbers, squashes, melons, almond, peach, guava, gooseberry, mango, coconut, etc.), legumes (alfalfa, berseem and other clovers, vetches, broad beans, dwarf beans, arhar, etc.) and vegetables (radish, cabbage, turnip, carrot, onion, cauliflower, gourds, etc).
- 1.6 Seed and fruit production of cross-pollinated crops can be increased considerably in areas where there is a dearth of natural pollinators by placing honey bee colonies in the crop when it is in bloom. It is essential to know the pollination requirement of individual crops and the pollinator species that is important for each situation. Conservation of native and wild pollinators and cultivating native pollinators and utilizing them for planned pollination holds the key for success of seed and fruit production in cross pollinated crops.

B. ROLE IN EMPLOYMENT GENERATION, RURAL DEVELOPMENT AND NUTRITIONAL SECURITY

- 1.7 At present, it is estimated that around 4 lakh people in India are involved in beekeeping who keep about 34 lakh bee colonies and produce about 90 to 95 thousand tonnes of honey and the rest of the honey harvested from rock bee colonies. But, only less than 10 percent of the existing potential has been utilized so far. India comprises seven percent of the world's flora. India has a potential to keep about 200 million bee colonies that can provide employment to over 21.5 million people. In terms of production, these bee colonies can produce over 10 million tons of honey and about 15,000 tons of beeswax. Organized

collection of forest honey and beeswax using improved methods can result in an additional production of at least 120,000 tons of honey and 10,000 tons of beeswax. Thus beekeeping fulfils many of the sustainable development goals (SDGs) of United Nations Development Programme (UNDP). It helps to accomplish SDG-8 - 'Decent work and economic growth' and SDG-9- 'Industry, innovation and infrastructure'.

- 1.8 Beekeeping plays an important role in rural development, by providing income from sale of honey and other bee products, in addition to improving agricultural productivity. Beekeeping is suitable for rural farmers in many ways. Beekeeping does not take up valuable land that could be used for farming activities. It can be practiced by men and women of all age groups. The vast agriculture, horticulture and forest cover of India coupled with high level of involvement of rural population in agriculture make beekeeping an essential part of rural development. Because of the low level of sophistication needed, the beekeeping industry offers direct employment to lakhs of people including farmers, landless labourers, hill dwellers and tribals. Sustainability of beekeeping is therefore vital to the country's economic well being and development.
- 1.9 Pollinator-dependent food products contribute to healthy diets and nutrition. Pollinators affect 35 percent of global agricultural land, supporting the production of 87 of the leading food crops worldwide. Pollination-dependent crops are five times more valuable than those that do not need pollination. Pollinators play an essential role in helping to feed a rising world population in a sustainable way. In this way it fulfills another UNDP-SDG, Zero Hunger[SDG 2]. Bees and pollinators also contribute to fulfill the SDG 1, No poverty and SDG 3, Good Health and Well being.
- 1.10 In the past, honey was only considered a sweetener, whereas today we know that it contains many beneficial substances. Honey is a great source of simple carbohydrates. Nectar itself is composed mainly of sucrose and water. Bees add enzymes that create additional chemical compounds, inverting the sucrose into fructose and glucose, and then evaporate the water so that the resulting product will resist spoiling. Honey contains natural minerals and vitamins which help the metabolizing of undesirable cholesterol and fatty acid on the organs and tissues into the system, hence preventing obesity and promoting better health for us. The vitamins present in honey are B6, thiamin, niacin, riboflavin, pantothenic acid and certain amino acids. The minerals found in honey include calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium and zinc. Honey is rich in phenolic acids and flavonoids, which are a source of natural antioxidants. Honey has a healthy glycemic index, meaning that its sugars can be gradually absorbed into the bloodstream to result in better digestion.
- 1.11 It is an excellent nutrient and calmative. Owing to its antibacterial and antioxidant properties, it is widely used in folk medicine. Honey can be mixed into different drinks, for example tea, milk, yoghurt or natural juices. It can be added to various baked or cooked dishes (cakes, sauces, vegetables, meats), usually to infuse them with its special aroma. Honey can fully replace consumer sugar in our diet.

C. ROLE IN BIODIVERSITY AND ENVIRONMENTAL SUSTAINABILITY

- 1.12 In addition to increasing crop yield through cross pollination, honey bees also increase the biodiversity through pollination and perpetuation of a whole lot of plants in this world, wild or cultivated, in farm fields or forests. Thus bees and pollinators help to maintain biodiversity and a vibrant ecosystem which is also one of the UN SDGs [SDG 15]. More than 70 % of the world plants depend on insect pollinators for seed production. Pollination is one of the most important means in the preservation and support of biodiversity and, in general, life on Earth. Many ecosystems, depend on pollinator diversity to maintain overall biological diversity. Pollination also benefits society by increasing food security and improving livelihoods. Pollinators are extremely diverse, with more than 20,000 pollinating bee species and numerous other insect and vertebrate pollinators. Therefore pollinators are essential for diversity in diet and for the maintenance of natural resources.

CHAPTER 2

DIVERSITY OF HONEY BEES

- 2.1 Honey bees are insects that come under the order Hymenoptera and family Apidae that exhibit complete metamorphosis. Honey bee species are characterized by particular functional traits that facilitate pollination services. As of now, seven species of *Apis* have been described; India is an exclusive country which inhabits four of these; two domesticated species, viz. *Apis cerana* (oriental honey bee) and *A. mellifera* (occidental or European honey bee) and two wild species, viz. *Apis dorsata* (giant/rock honey bee or dumna) and *A. florea* (dwarf honey bee). Among the four species, *A. mellifera* is an introduced species to India. India is the place of origin of the genus *Apis*.

A. ROCK BEE (*APIS DORSATA*)

- 2.2 The name giant or rock bee arises from the fact that they often build their nests underneath rock overhangs, such as large cliff faces. However, it can also be found on the tree branches and ceilings of tall buildings without any constraints. The behaviour of the species is unpredictable. They are aggressive in nature and have well organized mass defense behaviour. Slight disturbance by



Fig.1. *Apis dorsata*, Rock bee nest

the intruder provoke the activity of worker bees and mark the intruder by the odour of specific pheromone. In India, the rock bee honey has greater economic value as this species is a good honey gatherer. Because of the danger involved in harvesting rock bee honey, it is generally priced high locally. Night hours is mostly preferred by the trained bee hunters who with the help of smoke, pacify the bees and cut the comb for honey extraction. There is general concern that the total number of *A. dorsata* nests all over Asia is declining, partly due to shrinking forest areas, the use of toxic pesticides in foraging farm lands and bee hunting. There are many forest and hilly regions in many of the Indian states where people

hunt for rock bee honey and squeeze the combs to extract the honey. Rock bee constitutes to approximately 20% of the total honey produced in India, even though there is no clear official estimate available.

B. LITTLE BEE (*APIS FLOREA*)

- 2.3 Dwarf or little honey bee is also a wild honey bee spp., found in Asia. When compared to the rock bees these bees are small and less ferocious. Dwarf or little honey bee is the smallest of *Apis* species both in size of the body and the nest. *A. florea* is highly migratory and shifts its nests more frequently within 2 - 5 months. Like *A. dorsata*, these bees build single vertical combs around twigs or branches of trees and shrubs (Mishra, 1995). *A. florea* are excellent pollinators of crops because of their smaller size that limit their flight distance and hence exploit the flowers intensively. The honey produced by these bees is dramatically less of about half a kilo of honey per year per hive and also priced high because of great medicinal value. The quantity of honey that is taken from these honey bees is negligible. However they act as good pollinators and need to be conserved.



Fig.2. *Apis florea* little bee nest

C. INDIAN HONEY BEE (*APIS CERANA*)

- 2.4 Indian, Eastern or Asiatic honey bee (*Apis cerana*) is the native bee species of Asia and before the introduction of *A. mellifera*, this was the only domesticated honey bee species in India. Three sub-species of *A. Cerana* are found in India: *A. cerana indica*, *A. cerana cerana* and *A. cerana himalaya* corresponding to the geographic distribution. Indian bees construct multiple parallel combs in dark places such as hollows of trees and holes in the rocks, clay pots, logs, wall, etc. Presently, in Kanyakumari district of Tamil Nadu more than 20,000 beekeepers are involved in beekeeping with Indian bees. Beekeepers in many of the Indian States including Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Telengana, Odisha and North Eastern States, cultivate this species of honey bee and are dependent on it for their livelihood. The average yield of honey per hive is 7 to 10 kg per hive per year.



Fig.3. Workers of Indian honey bee, *Apis cerana indica*

D. ITALIAN HONEY BEE (*APIS MELLIFERA*)

- 2.5 The Italian honey bee (*Apis mellifera ligustica*) is one of the subspecies of *A. mellifera*, the European bee. This species of honey bee is native to Africa, most of Europe and the Middle East. Italian bee was introduced into India in the 20th century when the beekeeping industry with the native bee, *A. cerana* was badly hit because of the outbreak of tracheal mite, *Acarapis woodi* and Thai sacbrood virus during 1965-1986 (Abrol, 2004). Presently beekeeping with *A. mellifera* is more in North India because of the rich flora viz., safflower, mustard, sun flower but in South India it is hardly practiced since rice is the major crop in south India, these bees don't get enough amount of food they need. The habits are similar to Indian bees, construct parallel combs in dark places and honey is stored at the top portion of the colony. They are bigger than all other honey bees except *A. dorsata*. The average production capacity of this species depends on availability of flora and climatic conditions. In normal conditions, on an average, production of 50 to 60 kg per hive per year can be obtained from this species.



Fig.4. *Apis mellifera* worker bees

E. STINGLESS BEE (*TETRAGONULA IRIDIPENNIS*)

- 2.6 Stingless or dammer bees are of smallest size compared to other honey-yielding bees (less than 5mm). They belong to the family Apidae and sub family Meliponinae. These bees are widely known as dammar



Fig.5. Brood of stingless bees *Tetragonula iridipennis*

- bees in India, (dammar is resin from dipterocarp trees) with additional local names commonly applied, e.g., “putka” in Sikkim and Nepal, “ngapsiwor”, “ngaphamang”, and “ngapkhyndew” in Khasi language, “cherutheneecha” and “arakki” in Kerala.
- 2.7 As the name implies these bees cannot sting as their stingers are highly reduced, but they try to defend their colony from intruders by using their mandibles. The stingless bees have the importance in the pollination of various food crops and they can be domesticated. The honey yield per hive per year is very low, approximately 100 g, however the honey fetches a very high price of Rs. 2000 to 3000 per kg for its medicinal value in traditional Indian

medicine. As in other regions where stingless bees occur, colonies have been kept in tree logs, wooden boxes, and clay pots for harvesting small quantities of highly prized medicinal honey, and also for the wax and propolis, produced and gathered by the bees and used for its household and curative properties. The materials used for nest building are mainly pure wax or cerumen; A mixture of wax and propolis, resins, plant fibres, and clay.

F. SOCIAL ORGANIZATION OF BEES

- 2.8 One of the most superior characters which honey bees exhibit is eusociality in which they live in colonies with a highly organized system of division of labour, take care of their young ones with cooperative brood care and have other advanced ways of communications and defensive

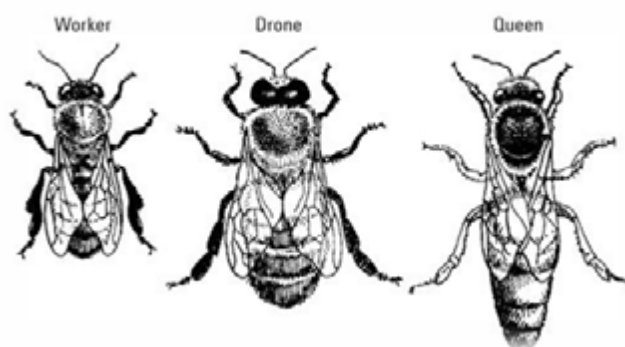


Fig.6. Worker, drone and queen of a honey bee society

- mechanisms. There are three castes: queen, workers and drones. In a normal colony there is one queen, 10,000 to 30,000 workers and a few hundred drones. In *A. mellifera* colony the number of workers before honey flow may go to 60,000 - 70,000. The queen is a functional fertile female that produces males and females, the worker is an unfertilized female capable of only producing males (due to the haplodiploid sex determination system found in honey bees) and the drone is male.

- 2.9 Owing to the high number of worker honey bees in each hive that engage in foraging of crop plants thus aiding in cross pollination, honey bees are highly suitable for managed pollination than any other species of insect or animal. Placing a few hives in the vicinity of the cropped area helps in large number of honey bees working in a society and accomplishing crop pollination sufficient to produce seeds and fruits that man consumes in his daily life.

CHAPTER 3

BEE PRODUCTS

- 3.1 Honey bees provide a wide range of benefits to humans from honey, other bee products, pollination of food crops and ecological services. Beekeeping is practiced around the world, and can provide a valuable source of income to people in developing regions with relatively little investment.
- 3.2 The best known primary products of beekeeping are honey and wax, but pollen, propolis, royal jelly and bee venom are also marketable primary bee products. There are additional uses where bee products are an ingredient of another product. Due to the quality and sometimes almost mystical reputation and characteristics of bee products, the addition to other products usually enhances the perceived value or quality of these secondary products. This can increase the profitability of many beekeeping operations.

A. HONEY

- 3.3 Honey is commonly referred as golden liquid because of its unrivaled properties along with colour resemblance. Honey is composed primarily of fructose and glucose but also contains fructo-oligosaccharides and many amino acids, vitamins, minerals and enzymes. Composition of honey varies based on the nectar it was made.



Fig.7. Honey – the golden liquid

- 3.4 Decapping of the sealed wax layer of honey combs is done using a sharp, thin and long knife or decapping knife. Extracting the honey from honey combs is done with the help of honey extractor (works on the principle of centrifugal force) in the case of Indian and Italian bees and squeezing of honey combs in the case of rock bees, little bees and stingless bees. Processing of honey is done to prevent granulation and fermentation. In India, most of the apiaries, process the honey by traditional method of indirect heating in which a vessel containing honey is heated by placing it in another vessel containing hot water, so that the honey gets its required heat from the hot water. The yeast cells present in honey are

killed while heating / processing making honey less susceptible to ferment. For large scale processing of honey, honey processing units are used.

B. ROYAL JELLY

3.5 Royal jelly is a secretion of hypopharyngeal glands and mandibular glands of nurse bees in a ratio of 1:1. Royal jelly plays a vital role in caste differentiation of honey bees. Queen bee is fed with this nutritious royal jelly throughout its life time, while the drone and worker bees are fed for short time (2/3 days in their immature stages). As a result of the complex composition of royal jelly (lipids, proteins, mineral salts, vitamins, enzymes, oligo-elements and natural antibiotics), it is also said to have specific vital factors that act as biocatalysts in cell regeneration processes within the human body.



Fig. 8. Royal jelly- Nature's Super-food

- 3.6 Production of royal jelly is related to rearing of queen bees and so the technology for royal jelly production is similar to that for mass queen rearing. It is because the queen larvae can't consume the royal jelly at a rate at which it is supplied to them and there is always surplus of it surrounding the larvae which can be extracted at the cost of the queen larvae. Royal jelly has a low shelf life and so it must be kept in refrigerator (0°C to 5°C). Since royal jelly is an emulsified product and not cellular tissue, freezing presents no particular problem and common household freezers can be used. It can be kept in a freezer for about 6 months.
- 3.7 Royal jelly is sold at very high prices in international market as dry powder in capsules or as formulation with honey. Commercial production of royal jelly is restricted to *A. mellifera* in India and that too by a very few beekeepers. Lack of awareness about the demand for the products and its production technologies are the reasons for its low production in India.

C. POLLEN

3.8 Pollen collected by honey bee and carried back to the hive is called bee pollen. Bee pollen is the chief source of protein, lipids, amino acids, minerals, vitamins etc. in the honey bee diet. Pollen is also considered as a complete food for human beings. It is used in apitherapeutic treatments as it is said to have properties such as antifungal, antimicrobial, antiviral, anti-inflammatory, immune stimulating, and local analgesic and also facilitates the burn wound healing.



Fig.9. Bee pollen

3.9 Pollen is carried back to the hive on the third pair of legs of the honey bee, which are specially modified for this purpose. Only a tiny amount can be carried back to the colony at each trip (around 10 mgs per load) and bees in a hive need about 20 kilograms for their annual development. It is clear that this constitutes a remarkable feat of social co-ordination by the bees - in fact this takes 2 million pollen

collecting trips for the colony every year. Pollen is mixed with enzymes and nectar in a way that allows it to be stored by the bees for a considerable time.

- 3.10 Pollen is collected by placing the pollen traps at hive entrance at which the pollen packed in the hind leg corbícula of the returning bees will get discharged. Pollen trap designing is a crucial factor for the welfare of the colony. It should also not stress the colony by trapping too much of pollen or else it will lead to reduced brood rearing and honey production. A trap that removes 50-60% incoming pollen during nectar flow is ideal and can be kept in place for the year round with little adverse effect on the colony.
- 3.11 Bee pollen is sold in market for prices ranging from Rs. 2000 to 20000 per kg depending on the crop from which it is collected by bees. There is vast scope for increasing its production based on demand in local and international market.

D. BEESWAX

- 3.12 Bees produce wax from the wax secreting glands and they use this wax for construction of comb, in which their immature stages live and they also store pollen and honey in the hexagonal cells of the comb which is made up of beeswax. Pure fresh form of beeswax is white in color but later turns into yellow as a result of the presence of pollen and other substances. And so brown or yellow coloured beeswax is available in the market. Wax is secreted by 14-18 days old worker bees. And to produce one part of wax, bees has to consume about 4-7 times as much honey. Beeswax has resistance to the action of acids and is also insoluble in water and cold alcohol. But wax can be dissolved partially in boiling alcohol, and completely in chloroform, in carbon disulfide, and in the essence of hot turpentine.
- 3.13 The beeswax is used in several industries such as cosmetic, electric and textile industry, church candles, carbon paper, metal castings and mouldings and shoe polish. Apart from these, it can also be used in beekeeping industry for preparation of comb foundation sheet. Beeswax is also used in food processing industry for coating metal containers internally against the effects of acids from fruit juices and honey.



Fig. 10. Beeswax and comb foundation sheet made of beeswax

- 3.14 Beeswax is the bee product that is produced in large quantities next to honey in India. The market price of beeswax is Rs.400 to 700 per kg.

E. BEE VENOM

- 3.15 Bee venom is injected by honey bees using their sting to defend themselves from the intruders. Bee venom has a history of healing back pain, musculoskeletal pain, and skin diseases. Quantity of bee venom produced by worker bees vary between 100 to 150 μg . Bee venom is collected by making bees at hive entrance to come in contact with metal strings connected to direct current of low voltage and giving mild shock so that the bees sting and release venom that can be collected on glass plate placed under the strings.



Fig.11. Bee venom collected using bee venom collector

E. PROPOLIS

- 3.16. The word propolis has Greek origin, 'pro' meaning 'in defense of' and 'polis' meaning 'city', i.e. defense of beehives. It is produced by Italian and stingless bees and not seen in Indian bee, rock bee and little bee. Honey bees use propolis for sealing the cracks and crevices and unwanted holes in the hive; for spreading around the hive entrance as repellent to the intruders like ants. It is collected by bees from tree resins, flower-buds, and other vegetal tissues. At the time of collection, bees mix their wax and collected resins to make propolis.



Fig.12. Bee collected propolis

- 3.17 Propolis has different compounds such as esters, fatty acids, carbohydrates terpenoids, vitamins, and inorganic substances and has numerous therapeutic properties, such as antibacterial, anti-inflammatory, healing, anesthetic, anticariogenic, antifungal, antiprotozoan and antiviral activities. It can be collected by scrapping off the hive parts or by using the propolizing plastic screens, which are placed on the top bars of the hive.

CHAPTER 4

BEEKEEPING EQUIPMENTS

A. BEEHIVES

- 4.1 A beehive is a wooden box in which a honey bee colony is kept and reared for the purpose of honey extraction and crop pollination. The beehive is designed taking into account the natural habitat and place of living of honey bees. It has various parts namely hive stand, floor board, brood chamber, super chamber, inner cover and outer cover or top cover.

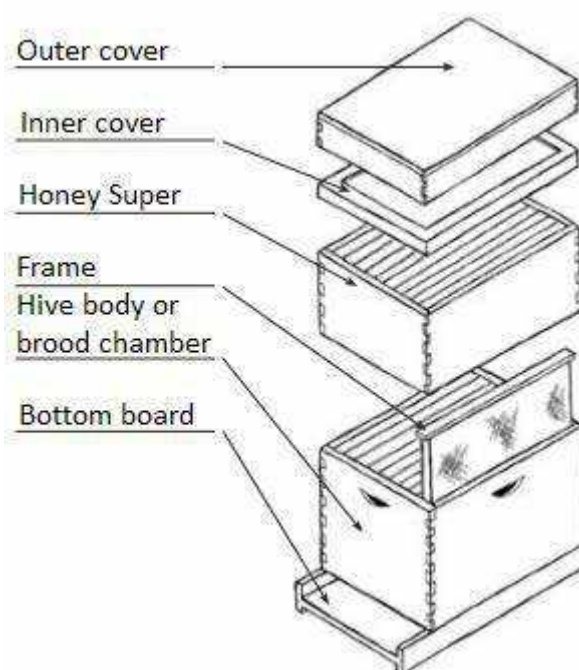


Fig.13. Structure of a beehive

- 4.2 The Bureau of Indian Standards (BIS) has prescribed two types of beehives namely Type 'A' and 'B' for the Indian honey bee (*Apis cerana*). After introduction and successful rearing of *A. mellifera*, type 'C' beehive was designated for this species of bee and standards were prescribed. The variation in type of beehive for *A. cerana* is to accommodate bees that vary in their size and requirement between south and north India.

B. OTHER BEEKEEPING ACCESSORIES

- 4.3 Decapping knife to remove wax covering of combs before honey extraction, hive tool to separate the frames that get stuck due to propolis, bee brush to brush off bees from honeycombs before it is used for honey extraction, dummy division board that serves as a movable wall and helps to reduce the size of the brood chamber, feeders for feeding sugar syrup to bees, comb foundation sheet made of beeswax that serve as base for building combs, pollen traps that collect pollen pellets by scraping them from the legs of the returning foragers and honey extractor, usually a metal drum with a centrifugally rotating device, for the extraction of honey from the frames are the important accessories used in rearing of the honey bees.
- 4.4 Safety equipment against bee stings that a beekeeper wears during hive inspection include smoker for pacifying bees, bee veil worn over the face, gloves that protect fingers, overalls made of thick cloth that protect the whole body from bee stings and the high boot that protect legs from bee stings and also from other poisonous creatures in the garden.



Fig.14. Beekeeping accessories

CHAPTER 5

STATUS OF BEEKEEPING IN INDIA

A. HISTORY OF BEEKEEPING

- 5.1 In India, different species of honey bees (described in chapter 2 of this report) are being reared in different locations. The practice of keeping bees in India dates back to ancient times when people hunted honey from feral colonies of the rock bee (*A. dorsata* Fab.), the little bee (*A. florea* Fab.) and the Indian hive bee (*A. cerana indica* Fab.) (Kishan Tej et al., 2017). The Indian hive bee was a domesticated species but was kept in wooden logs or walls until the end of 19th Century. After the discovery of movable frames, this design and technique were adopted for Indian hive bee from the western countries.
- 5.2 In south India, Rev. Father Newton in 1909 studied the frame size suited to combs of the *A. cerana indica* Indian bee, designed a hive for Indian hive bees, a cheap honey extractor, set up apiaries in Tamil Nadu (Fig. 15) and also introduced beekeeping to many parts of South India. He maintained the Indian honey bees in hives successfully and trained several beekeepers during 1911-17 in Kanyakumari district in the extreme south. This smaller hive named, as 'Newton hive' is in common use even today for beekeeping in plains. This got popularized particularly in the south and central India (Shinde and Phadke, 1995). Travancore state took up the work of beekeeping in 1917, Mysore in 1925, in Kashmir it began around 1927, in Punjab in 1933 and in Uttar Pradesh in 1938. Today, the Indian bee, *A. cerana* is reared to a greater extent in Tamil Nadu, Kerala, Karnataka, Andhra Pradesh, Telengana, Odisha and North Eastern States and to lesser extent in Kashmir and Himachal Pradesh. In north India, the Indian bee is bigger in size and darker and is usually called the *A. cerana cerana*, while in south the bee is yellowish and smaller and is called *A. cerana indica*. In other states, the introduced bee, *A. mellifera* is being reared.



Fig. 15. Apiary was started at Insectary in Agricultural College, Coimbatore in 1913

- 5.3 The scientists and beekeepers of India lured by the high honey yield and other good attributes of the exotic honey bee, *A. mellifera* Linn. introduced this species into India. Several attempts were made to introduce and establish *A. mellifera* into various parts of the country from 1920s to 1950s. Successful introduction and establishment of *A. mellifera* was achieved in the erstwhile Punjab in 1962, through “Interspecific Queen Introduction Technique” and later on through the import of disease-free nuclei (Atwal and Sharma, 1968, 1970). The stocks of *A. mellifera* existing in the country at present are the progeny of the import of queens and disease free nuclei of exotic honey bee imported into India from 1962-1966. Currently *A. mellifera* is reared in Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Bihar, Rajasthan, Jammu and Kashmir and other north Indian states to greater extent (Partap and Verma(2000)). In central India, this bee is reared in Gujarat, Maharashtra, Madhya Pradesh, Chhattisgarh and West Bengal. Recently, *A.mellifera* beekeeping has picked up in Andhra Pradesh, Telengana and Tamil Nadu also in some pockets where more flora is available.

B. MIGRATORY BEEKEEPING

- 5.4. Migratory beekeeping provides good returns to the beekeeper as the returning bees to the hive are maximum, because of abundant flora in that region. For doing commercial migratory beekeeping, the beekeeper has to map the floral resources available and do planned migration accordingly (Fig. 16). In northern India, commercial beekeepers shift the colonies between plains and hills for migratory beekeeping. During October-November, colonies are migrated to the plains of Uttaranchal, Uttar Pradesh, Haryana, Punjab and Rajasthan to exploit rapeseed and mustard. During December–January, colonies are migrated to eucalyptus plantation of Uttar Pradesh and Haryana. Bee colonies are also migrated to litchi orchards at Ram nagar and Dehradun from February to March, to sunflower fields of Punjab and Haryana and to forest plantations of Uttar Pradesh for Shisham flowers (Indian Rosewood) till May.



Fig.16. *Apis mellifera* foraging litchi inflorescence in Haryana



Fig.17. *A. mellifera* bee hives kept for pollinating in apple orchards in Kashmir



Fig.18. Honey bees on *Robinia pseudoacacia* trees in Kashmir region



Fig.19. *A. mellifera* kept in mustard fields of Rajasthan



Fig.20. *A. cerana indica* beekeeping in the North East India
by Nagaland Beekeeping and Honey Mission (NBHM)



Fig.21. Stingless bee beekeeping by Nagaland Beekeeping and Honey Mission (NBHM)



Fig.22. Harvesting rock bee *A. dorsata* honey in North east india



Fig.23. Experimenting cucumber pollination by stingless bees in Tamil Nadu and Manipur



Fig. 24. *A. mellifera* migrated to a coriander field in Tamil Nadu



Fig. 25. *A. cerana indica* beekeeper at an onion field in Tamil Nadu



Fig. 26. Stingless bees reared in pots and bamboo nodes in Tamil Nadu and Kerala



Fig. 27. *A. cerana* kept in rubber plantations, honey on sale in Kerala

- 5.6 In southern India, migration of bee colonies from southern Tamil Nadu (mainly Marthandam of Kanyakumari District) to Kerala during January-March is a renowned practice. The commercial beekeepers migrate the colonies to rubber plantations which are spread over about 0.40 million hectares. During that period, beekeepers harvest tons of honey and store to sell when they get better price. Rubber is considered as the third major source of honey next to rapeseed/mustard and sunflower in India. Beekeepers from Kerala and Tamil Nadu migrate their colonies mainly to Quilon, Kottayam, Changanacherry, Trichur, Palghat, Kozhikode and Cannanore districts for rubber-honey flow. In Tamil Nadu, during May-June,

beekeepers migrate the colonies for harvesting nectar from tamarind flowers. Colonies are also migrated to high ranges of Devikulam, Peermedu, Idukki and other districts to cardamom estates.

C. FLORAL CALENDAR PREPARATION

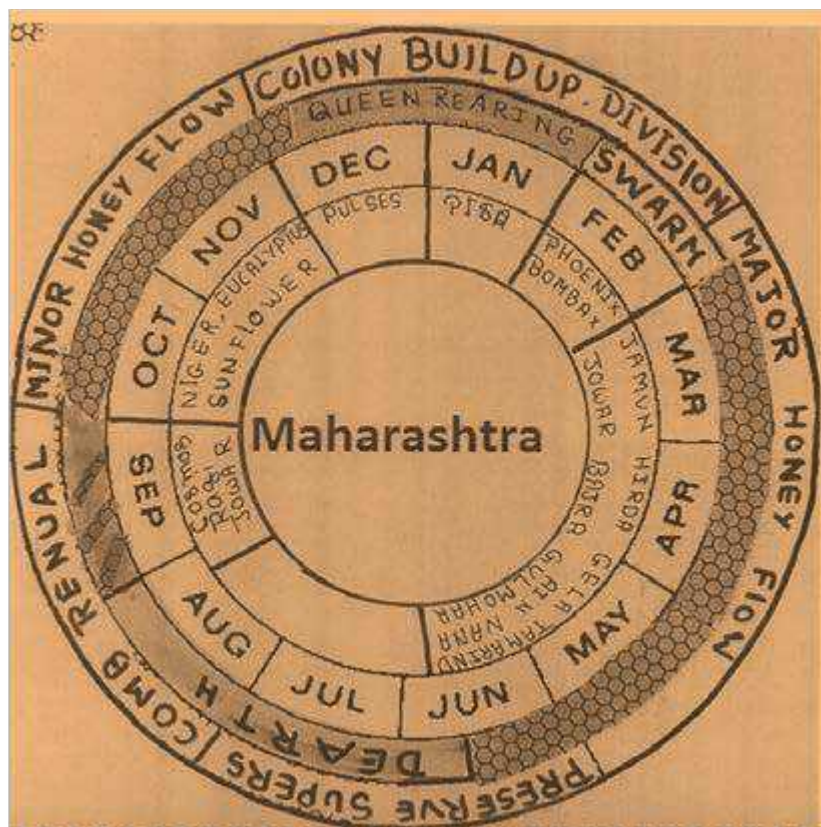


Fig. 28. Floral calendar for Maharashtra State (Source: CBRTI, Pune)

District	Jan		Feb		Mar		Apr		May		June		July		Aug		Sep		Oct		Nov		Dec	
	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
AHMEDNAGAR																								
<i>Cajanus cajan</i> (तुवर)																								
<i>Carthamus tinctorius</i> (कुसुम)																								
<i>Cicer arietinum</i> (चना)																								
<i>Citrus aurantifolia</i> (कागजी निंबू)																								
<i>Citrus reticulata</i> (संत्रा)																								
<i>Citrus sinensis</i> (मोसंबी)																								
<i>Cocos nucifera</i> (नारियल)																								
<i>Elusina coracana</i> (रागी)																								
<i>Emblca officinalis</i> (आवला)																								
<i>Eucalyptus spp.</i> (निलगिरी)																								
<i>Guizotia abyssinica</i> (रामतील)																								
<i>Helianthus annuus</i> (सूर्यफूल)																								
<i>Moringa oleifera</i> (शेवगा)																								
<i>Musa paradisaica</i> (केला)																								
<i>Oryza sativa</i> (चावल)																								
<i>Pennesetum typhoides</i> (बाजरा)																								
<i>Phoenix sylvestris</i> (शिंदी)																								
<i>Pongamia pinnata</i> (करंज)																								
<i>Psidium guajava</i> (अमरुद)																								
<i>Pulses</i> (कडधान्य)																								
<i>Sesamum indicum</i> (तेल)																								
<i>Sorghum vulgare</i> (ज्वार)																								
<i>Syzygium cumini</i> (जामून)																								
<i>Tamarindus indica</i> (इमली)																								
<i>Vigna mungo</i> (मूंग)																								
<i>Vigna radiata</i> (उडद)																								
<i>Vitis vinifera</i> (अंगूर)																								
<i>Zea mays</i> (मकई)																								
<i>Ziziphus spp.</i> (बेर)																								

Major Pollen

Minor Pollen

Minor Nector

Major Nector

Fig. 29. Floral calendar for Ahmednagar district of Maharashtra state (Source, CBRTI, Pune)

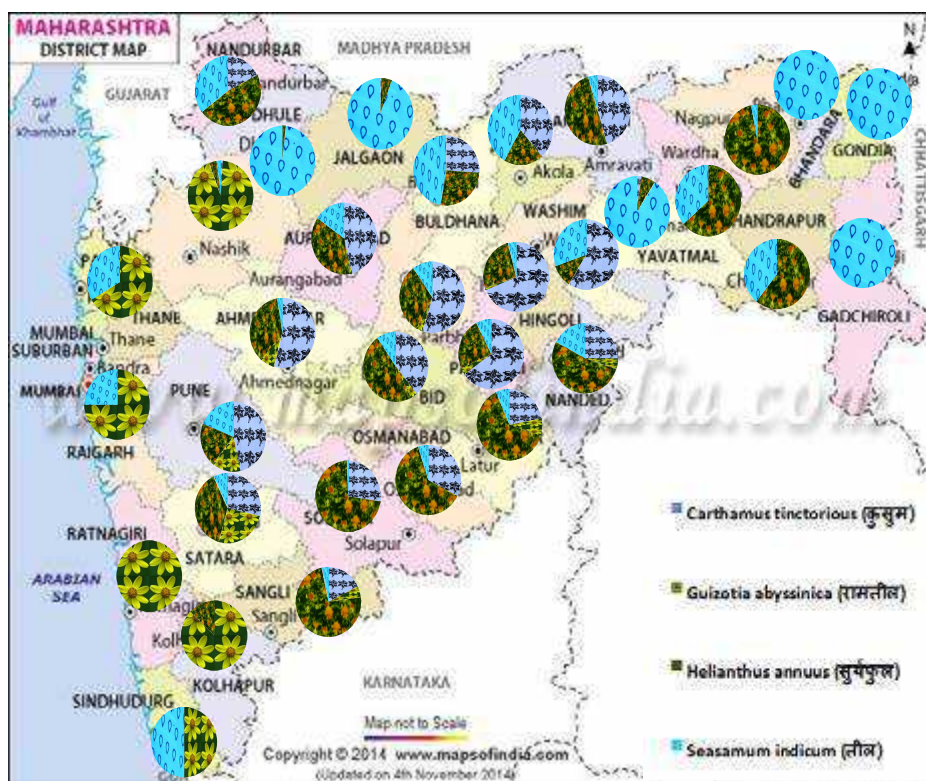


Fig. 30. District wise oilseed growing map of Maharashtra (Source: CBRTI, KVIC, Pune)

STATE WISE FLORAL CALENDAR OF INDIA (SOURCE, KVIC, 2018)

Migration places	Period	Honey crop for harvest
Jammu & Kashmir		
Higher hills	Mar-Apr	<i>Robinia pseudoacacia</i>
Lower hills	Oct-Mar	<i>Isodon rugosus</i> , <i>Brassica campestris</i> , <i>Wendlandia</i> & <i>Toon</i>
Himachal Pradesh		
Solan, Kangra, Una,	Aug-Oct	<i>Isodon rugosus</i> , <i>Guizota abyssinica</i>
	Jan –Feb	<i>Brassica campestris</i> var.toria, <i>Prunus</i> ,
	Mar-May	<i>Wendlandia</i> & <i>Acacia</i>
Haryana		
Hisar, Ambala, Hansi, Kurukshetra, Pehwa, Kaithal Bhiwari, Karnal	Oct-Dec	<i>Brassica campestris</i> var.toria, eucalyptus, litchi, berseem, sunflower
	Nov–May	
Punjab		
Gurudaspur, Hoshiarpur, Jalandhar, Amritsar, Ludhiana, Bathinda	Feb– Mar	Eucalyptus
	Apr-June	Litchi, citrus, prunus, berseem, sunflower
	Oct-Nov	<i>Brassica campestris</i> var.toria

Rajasthan		
Ganganagar, Sanghria, Padampur, Bharatpur, Karanpur, Alwar	Oct-Dec	<i>Brassica campestris</i> var. <i>sarson</i> and <i>B.juncea</i>
Madhya Pradesh		
Gwalior, Morena, Guna, Morena	Nov –Feb	<i>Brassica campestris</i> var. <i>sarson</i> and <i>B. juncea</i>
	Mar-Apr	Brassica and coriander
	Apr-May	Berseem, citrus
Uttaranchal		
Gangetic plains Thanda forest Ramnagar, Dehradun, Roorkee	Oct-Dec	<i>Brassica campestris</i>
	Jan-Feb	Eucalyptus
	Mar-Apr	Litchi, shishum
	May-Jun	Berseem, sunflower
Uttar Pradesh		
Aligarh, Agra, Mathura, Saharanpur, Gorakhpur	Aug-Oct	Maize, tur, <i>Brassica campestris</i> ,
	Oct-Dec	<i>Brassica campestris</i>
	Feb-Mar	<i>Brassica</i> , eucalyptus, shishum
	Dec-Mar	<i>Brassica</i> , eucalyptus, coriander
Bihar		
Bhagalpur, Champaram, Muzafarpur, Mehshi, Madhubani, North Bihar, Purnia, Begusari, Bhagalpur	Feb-Mar	Drumstic, khesari
	Mar-Apr	Litchi
	March,	Jamun
	May-Jun	Sunflower
	Nov-Feb	Brassica, coriander, khesari
Jharkhand		
Gumla, Ranchi, NetrahatGhati	Apr– Jun	Karanj
	Sept-Oct	Brassica, niger
West Bengal		
Sunderbans, Nodia, Hooghly, Midinapur, Midinapur	Apr-May	Mangroves
	March	Litchi
	Nov-Feb	Mustard, coriander
	Jan-Mar	Coriander, kalajeera, litchi
	Oct-Jan	Eucalyptus

Orissa		
Koraput, Jayapur, Malkanagiri	Oct-May	Niger, eucalyptus, bombax, coffee, jamun, herda, amla
Maharashtra		
Solapur, Ahamad Nagar, Latur, Nanded, Barshi Western Ghats and foot-hills, Amaravathi, Nagpur, Chandrapur	Oct-Dec	Tur, sunflower, sorghum
	May	Jamun, herda, gela
Andhra Pradesh		
Guntur, Karnool, Cuddapha	Jun-Jul	Sesamum, cucurbits, mustard, pulses, citrus
	Sept-Nov	Sunflower
Karnataka		
Bidar, Bijapur, Sulia, Bagamandla, Bangalore, Nandi hills	Sept-Dec	Tur, sunflower
	March	Rubber
	Apr-May	Coffee, <i>Schefflera</i> , <i>Lagerstroemia</i>
	Oct-Dec	Eucalyptus
	Feb-Apr	Rubber
Kerala		
Kottayam	Feb-Apr	Rubber
Tamilnadu		
Kanyakumari, Madurai, Salem, Erode	Feb-Apr	Rubber, coffee
	Sept-Jan	Sunflower
	May-Jun	Tamarind

Source: (KVIC, 2018)

It is essential to prepare floral calendars of different districts and states of India and also regularly update them. Such floral calendars are available with CBRTI, Pune of KVIC. These floral calendars will be highly useful in planning migratory routes during migratory beekeeping which is essential for honey production as well as crop pollination. Annex 1 has flora calendars of different districts of Maharashtra state. Annex 2 has district maps of Maharashtra state showing major cereal, oilseed and pulse growing areas.

D. HONEY PRODUCTION, CONSUMPTION AND EXPORT

I. INDIAN SCENARIO

- 5.7 India's arable land area of 159.7 million hectares is the second largest in the world. Based on the area under cultivation in India and bee forage crops, India has a potential to have about 200 million bee colonies while the current figure is about thirty four lakh colonies. The country has the prospective to increase honey production many folds from today's

(2017-18) figure of 105.0 thousand tonnes (Fig.31). (However, the data available with FAO shows a production of 64.9 thousand tonnes in India during 2017. This discrepancy needs to be scientifically verified). Increasing the number of colonies not only increases honey production, but also substantially boosts the productivity of agricultural and horticultural crops. Hence there is vast scope for increasing the number of bee colonies and development of beekeeping industry in the country.

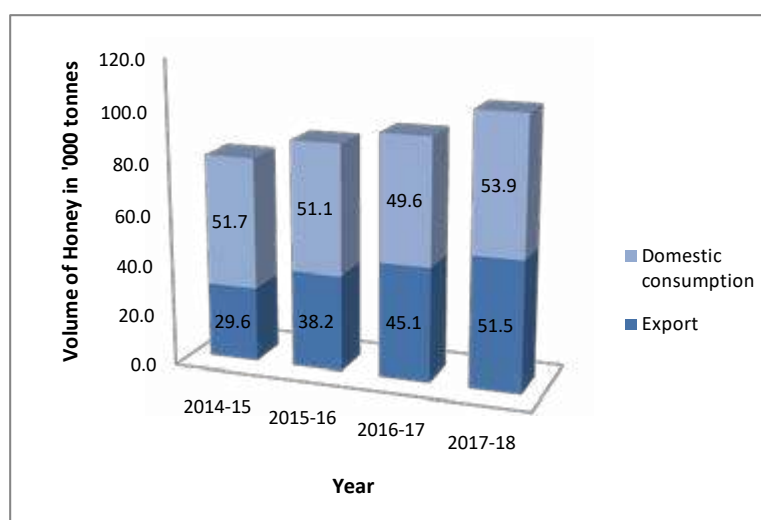


Fig. 31. India honey export and domestic consumption in last four years
(Source: NBB, MoA&FW)

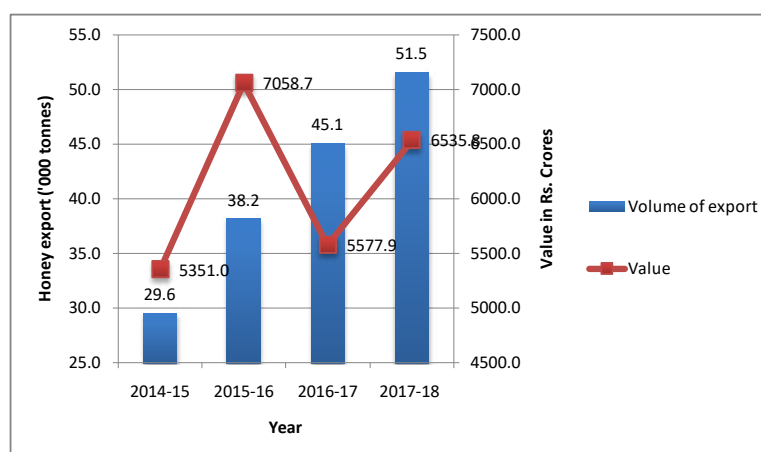


Fig. 32. Honey Export – volume and value (Source: NBB, MoA&FW)

- 5.8 The volume of export of honey has increased from 29.6 to 51.5 thousand tonnes between 2014-15 and 2017-18 (Fig. 31). The value of export of honey has not increased proportionately probably due to fluctuating global price of honey. The value of honey export was about Rs.6500 crores during 2017-18 (Fig. 32). The domestic consumption of honey has remained more or less stable around 50 thousand tonnes during the last four years (Fig. 31).
- 5.9 The number of bee colonies maintained by beekeepers in India is on the rise. It was 22 lakh in 2015 and has increased to about 34 lakhs in 2018 (Fig. 33). Out of this *A. cerana*

is estimated to account for about 5 lakh bee colonies and *A. mellifera* the rest. Honey production has also increased correspondingly in India during this period from 80 to 105 thousand tonnes.

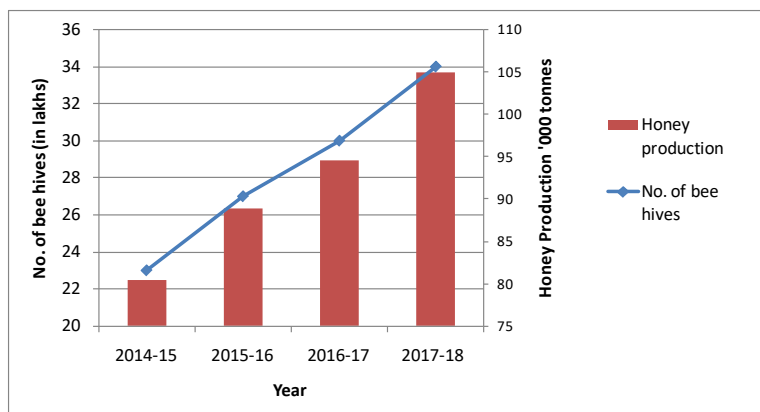


Fig. 33. Number of bee hives and honey production in India

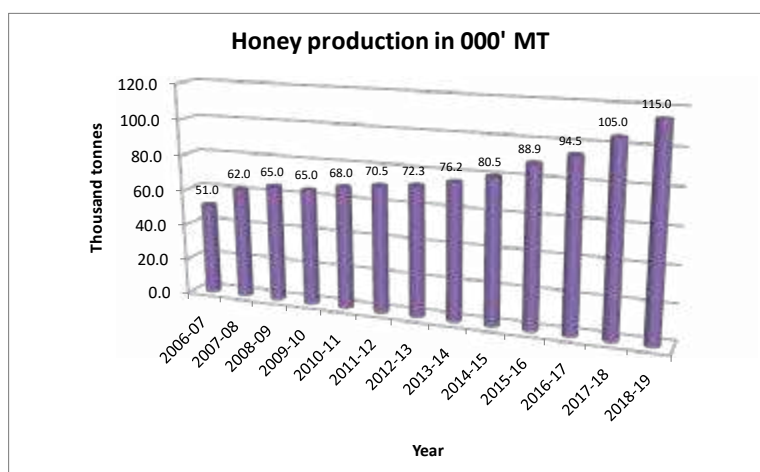


Fig. 34. Honey production in India over the years (NBB, MoA&FW, 2018)

- 5.10 When we look at the honey production in India in the last twelve years, we can see a gradual increase in production from 51 thousand tonnes to 115 thousand tonnes (2018-19 value is a projected one) (Fig. 34). This increase could be because of the efforts taken by the government to adopt scientific ways of honey production in India. The honey production data in India is collected by the NBB based on estimates obtained from leading beekeepers in various states which is pooled and expressed. There is no mechanism to find out if adulterated or fake honey was also included in the estimate. However a better way of estimating honey production would be to find out the number of beekeepers, number of managed bee hives and colonies, number of wild honey bee hives, estimate of feral colonies of domesticated hive bees, actual honey extracted etc. which will help to get a more accurate estimate of honey production in India.
- 5.11 Among the different states of India, the maximum honey production is from four states namely Uttar Pradesh, West Bengal, Punjab and Bihar which account for more than 50% of total honey production in India (Fig. 35). Rajasthan, Himachal Pradesh and Haryana also

produce considerable quantities of honey. These states derive the honey mostly from *A. mellifera* colonies while part of its honey comes from the wild bees or rock bees *A. dorsata* particularly in Sundarbans of West Bengal. The Southern states account for about 25 % of the honey produced in India that is obtained from the Indian bees, *A. cerana* and the rock bees *A. dorsata*.

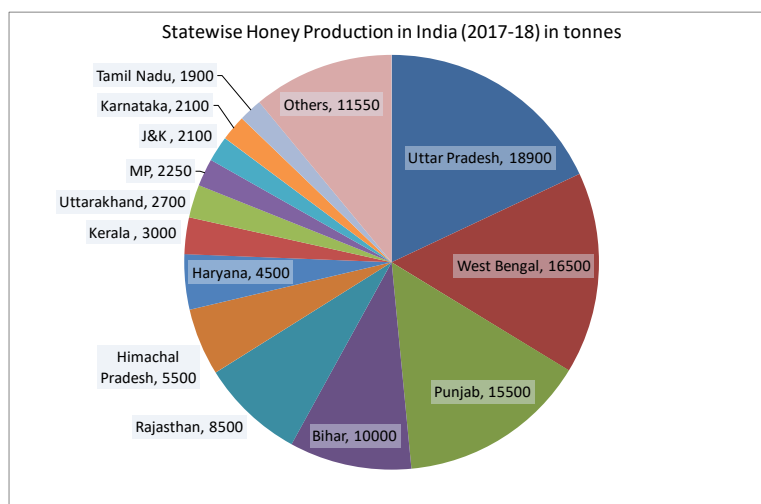


Fig. 35. Honey Production in various states of India during 2017-18
(Source: National Bee Board, MoA&FW, GoI)

II. WORLD SCENARIO

- 5.12 In 2017-18, China ranked first in honey production with 551 thousand tonnes while India ranked eighth among the world countries with 64.9 thousand tonnes (FAOSTAT, 2018) (Fig 36). As per 2016-17 data of FAO, China ranked first in exports with 131.6 thousand tonnes while India ranked fifth with 35.8 thousand tonnes (Fig 37). (However the honey production and export data pertaining to India taken from FAOSTAT varies from the data available with NBB, MoA&FW. With respect to the values given in this document, world figures have been taken from FAOSTAT and Indian figures have been taken from NBB.) USA, Germany, Japan, United Kingdom and France were the top honey importers of the world with USA importing 167 thousand tonnes (Fig 38). The honey consumption in kg/capita/year was highest in New Zealand (2.02) followed by Slovenia (1.61), Greece (1.55), Switzerland (1.41), Austria (1.32), Canada (0.79), USA (0.67), UK (0.66) and only 0.02 in India much lower than the world average consumption on 0.36 kg/capita/year (Fig 39.)

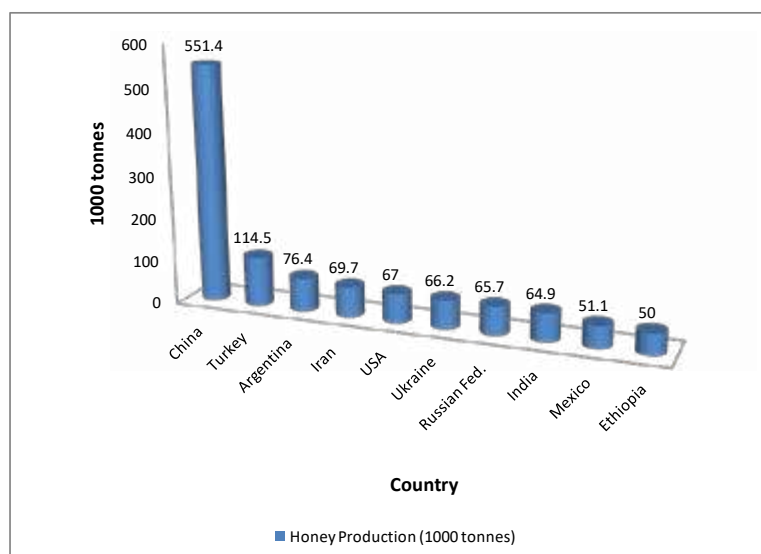


Fig. 36. Honey Production in 2017-18– World scenario (Source: FAOSTAT)

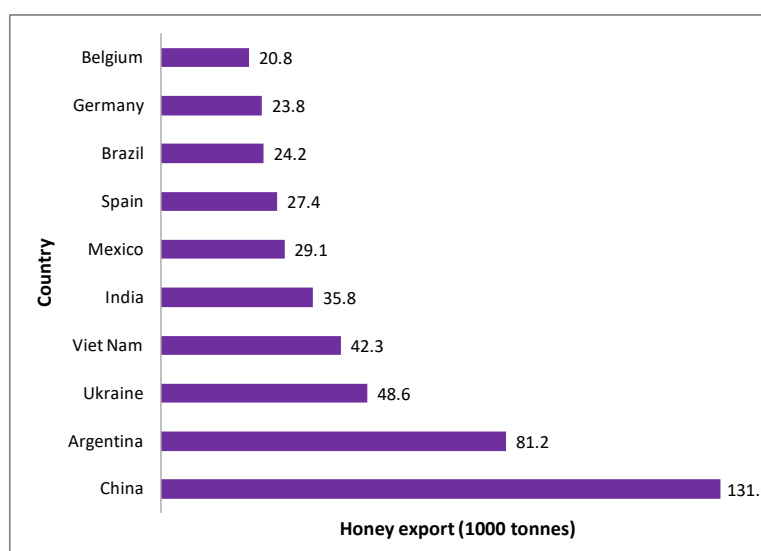


Fig. 37. Export of honey in 2016-17 by different countries of world (FAOSTAT)

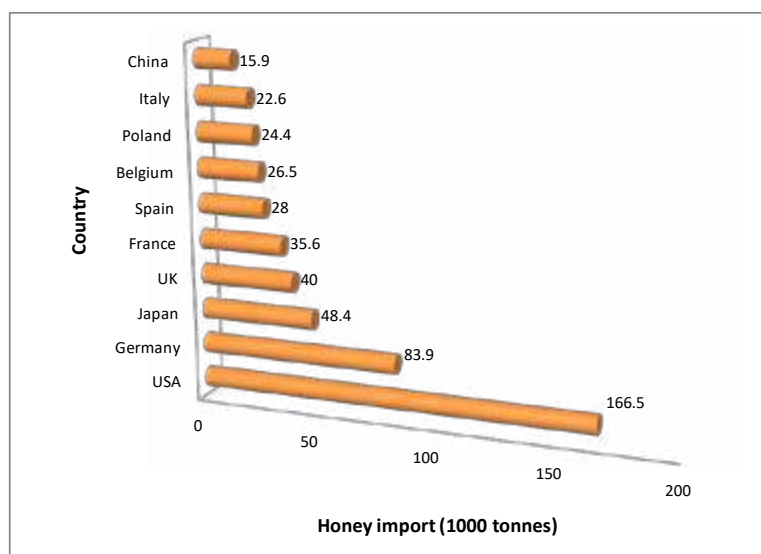


Fig. 38. Honey import by different world countries 2016-17 (FAOSTAT)

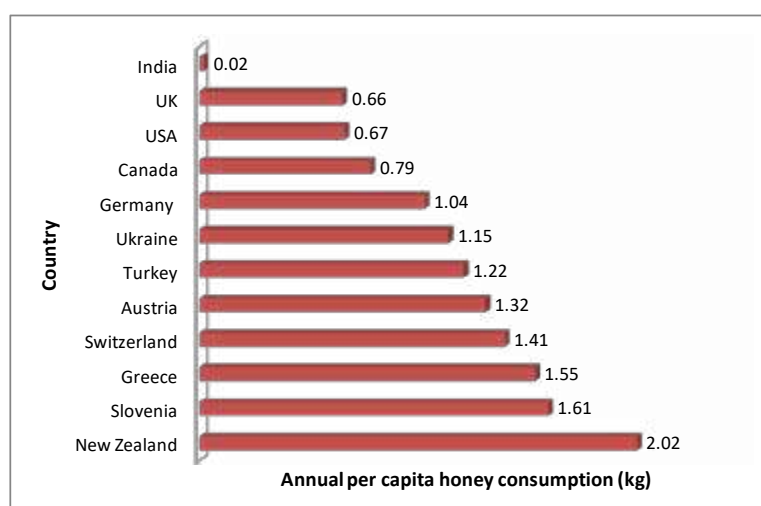


Fig 39. Per capita honey consumption 2013 (kg/ year) (FAOSTAT)

E. PESTS AND DISEASES ATTACKING HONEY BEES

5.13 Honey bees are affected by a large number of diseases caused by viral, bacterial, fungal, protozoan organisms, ecto- and endo-parasitic mites, birds, insects and higher animals. Major insect enemies of bees are wax moths, ants and hive beetles. Among diseases, the European foul brood is a major bacterial disease infecting *A. mellifera* while Sacbrood virus (SBV) is a major viral disease affecting *A. cerana*. Both the honey bee species are infested by Varroa mites while *A. mellifera* is specifically infested by brood mite *Tropilaelaps clariae*. Wax moth, *Galleria mellonella* (Fig. 40) is a major problem in *A. cerana*. The extent of losses may vary based on severity of infection or infestation, and may lead to decline in honey production or loss of bee colony all together. It is essential to detect the pests and diseases at initial stages for better management.



Fig. 40. Wax moth infested comb of *A. cerana* (Left) and Varroa infested *A. mellifera* (Right)

CHAPTER 6

MULTIPLE AGENCIES DEALING WITH BEEKEEPING IN INDIA

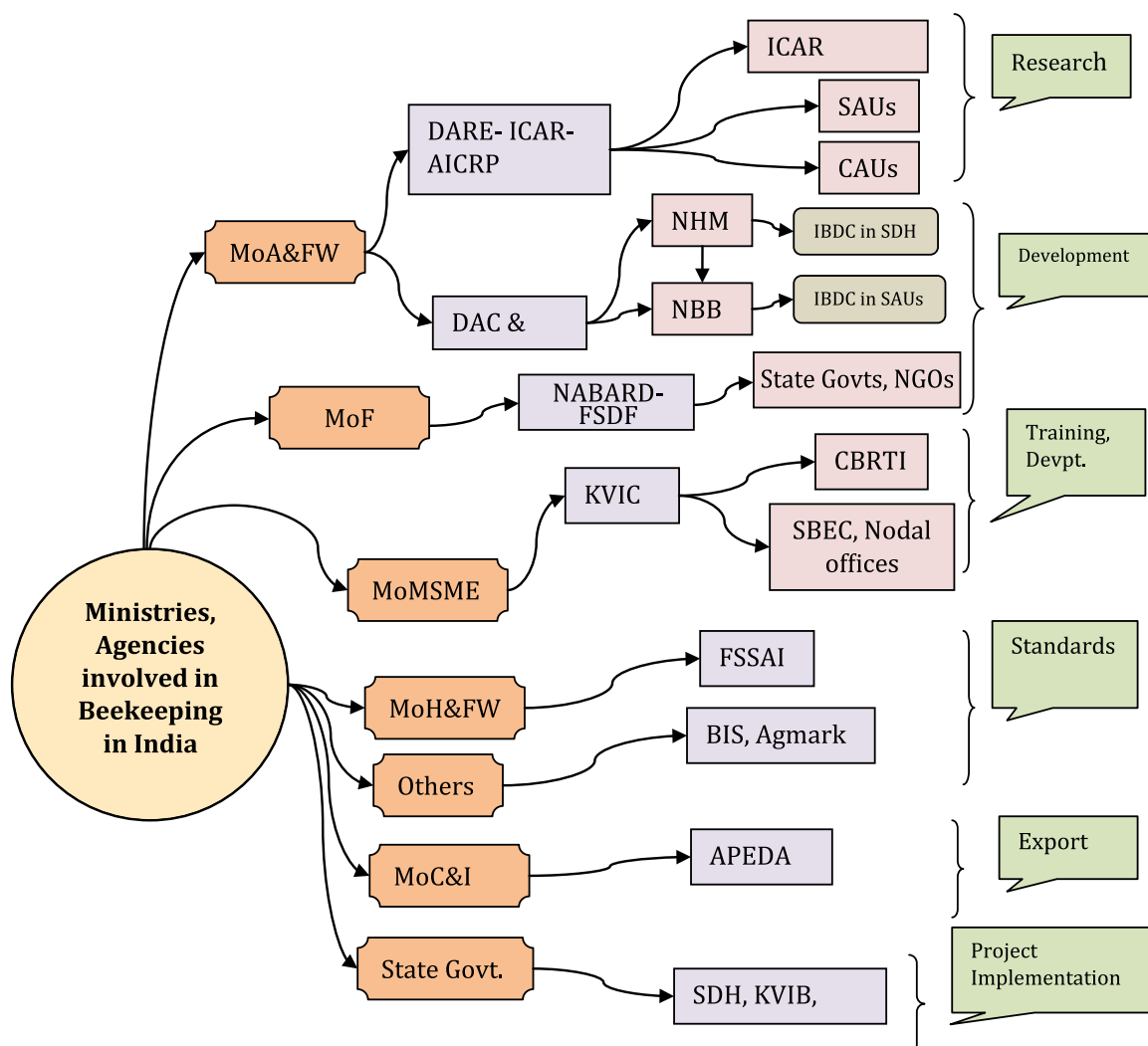


Fig. 41. Organizations currently involved in Beekeeping Research, Development and Training in India

6.1 In India, there are multiple ministries and departments associated with beekeeping. The Indian Council of Agricultural Research (ICAR) in Dept of Agrl. Research and Education

(DARE), Ministry of Agriculture and Farmers Welfare (MoA&FW), Government of India assisted by State Agricultural Universities (SAUs) is involved in research on beekeeping and its role in cross pollination and crop productivity increase (Fig. 41). The Khadi and Village Industries Commission (KVIC) in the Ministry of MSME, GoI considers beekeeping as a Forest based industry and is involved in developing beekeeping mainly for honey. The National Bee Board (NBB) and National Horticultural Mission (NHM) of Department of Agriculture Cooperation (DAC), MoA&FW, GoI with the objectives of pollination support and livelihood Improvement of farmers financially supports Integrated Beekeeping Development Centres (IBDCs) in State Agricultural Universities and Private beekeeping industry. The Food Safety Standard Authority of India (FSSAI) under Ministry of Health and Family Welfare makes standards for honey and bee products and implements it. Agricultural & Processed Food Products Export Development Authority (APEDA), Ministry of Commerce & Industry, Govt. of India deals with export of honey. NABARD through its Farm Sector Development Funds (FSDF), supports beekeeping by providing funds through State Governments and NGOs. Multiplicity of agencies involved in beekeeping development in India has led to lack of convergence and duplicity of efforts. Hence, the EAC-PM of GoI decided to streamline.

A. ICAR-AICRP ON HONEY BEES AND POLLINATORS

6.2 Based on the recommendations of National Commission on Agriculture, 1976 a project entitled “All India Coordinated Research Project on Honeybee Research & Training”, was launched by the Indian Council of Agricultural Research in 1980-81. The centers of the AICRP Project started functioning at different locations functioning under the then Central Bee Research Institute (CBRI), Pune (which is presently redesignated as Central Bee Research & Training Institute -CBRTI). Realizing the role of honey bees as pollinators and their role in increasing crop productivity, the project was upgraded to All India Coordinated Research Project on Honey bees and Pollinators in July, 2007.

6.3 The overall mandate of AICRP-HB&P is as follows

1. To assess pollinator diversity in different crop ecosystems
2. To quantify the role of specific pollinators in enhancing productivity in different crops/ cropping systems
3. To conserve and manage pollinators.
4. To takeup capacity building and HRD.

6.4 The following are the sub-centres of the AICRP on Honey bees and Pollinators located in various SAUs and ICAR centres in different parts of India.

Sl.No	Regular centres	State
1.	Dr.Y.S.P. University of Horticulture & Forestry	Solan, HP
2.	Punjab Agricultural University	Ludhiana , Punjab
3.	Orissa University of Agriculture &Technology	Bhubaneswar, Odisha

4.	Assam Agricultural University	Jorhat, Assam
5.	ANGRAU, Agricultural Research Station	Vijayarai, Andhra Pradesh
6.	Rajendra Agricultural University	Pusa, Samastipur
7.	CCS Haryana Agricultural University	Hisar, Haryana
8.	Kerala Agricultural University	Vellayani, Kerala
9.	G.B. Pant University of Agriculture & Technology	Pantnagar, Uttarakhand
10.	SASRD, Nagaland University	Medziphema, Nagaland
11.	Indira Gandhi Krishi Vishwa Vidyalaya	Raipur, Chhattisgarh
12.	University of Agricultural Sciences	Bangalore, Karnataka
13.	N. D. University of Agriculture & Technology	Faizabad, UP
14.	Sher-e-Kashmir University of Agricultural Sciences & Technology	Jammu (J&K)
15.	Maharaja Pratap University of Agriculture and Technology	Kota, Rajasthan
16.	Sher-e-Kashmir University of Agricultural Sciences & Technology	Kashmir (J&K)
17.	Himachal Pradesh Krishi Vishwa Vidyalaya	Nagrota Bagwan, HP
18.	Tamil Nadu Agricultural University	Coimbatore, TN
Voluntary Cooperating Centres		
19.	Bidan Chandra Krishi Vishwa Vidyalaya	Nadia, West Bengal
20.	Krishi Vigyan Kendra, Nimpith Ashram	Nimpith, West Bengal
21.	Directorate of Rapeseed and Mustard	Bharathpur, Rajasthan
22.	National Research Centre on Litchi	Muzzafarpur, Bihar
23.	University of Agricultural Sciences	Dharwad, Karnataka
24.	Navasari Agricultural University	Navasari, Gujarat
25.	Mahatma Phule Krishi Vishwa Vidyalaya	Rahuri, Maharashtra
26.	Central Agricultural University	Imphal, Manipur

B. NATIONAL BEE BOARD

- 6.5 The Ministry of Agriculture, Govt. of India launched a Central Sector Scheme titled 'Development of Beekeeping for Improving Crop Productivity' during the VIII plan (1994-95). The Department of Agriculture Cooperation (DAC) facilitated formation of the National Bee Board as a Registered Society under Societies Registration Act in July, 2000 and was promoted by the Small Farmers' Agri-Business Consortium (SFAC). In May 2005, beekeeping has been included as a supplemental activity under National Horticulture Mission (NHM)

for promoting cross pollination of horticultural Crops.

6.6 The National Bee Board (NBB) was reconstituted in June, 2006 including private sector. The main objective of the National Bee Board (NBB) is overall development of beekeeping by promoting scientific beekeeping in India to increase the productivity of crops through pollination and increase the honey production for increasing the income of the beekeepers/farmers.

6.7 Objectives of NBB:

- Overall development of scientific beekeeping in India by popularizing state of the art technologies through the governmental schemes of National Horticulture Mission and Horticulture Mission for North East and Himalayan States in the country.
- Development of nucleus stock production, capacity building programmes and training of bee breeders and beekeepers, processing, research work, etc. and conducting of seminars.
- Dissemination of information on technological advancement in the field of beekeeping through its various publications and the quarterly magazine “Bee World”.
- Initiating steps for quality honey production and other bee hive products for overseas and domestic markets besides enhancing productivity of various crops through bee pollination.
- Increasing the employment opportunity in rural sector and thus enhancing the ancillary income of the beekeepers & farmers.

6.8 The present organizational Structure of National Bee Board (NBB)

1. National Bee Board (NBB)/ General Body (GB) - 650 Members
2. Chairman- Secretary (AC&FW)
3. Vice – Chairman- Addl. Secretary, In-charge of Horticulture, DAC&FW
4. Member Secretary- Horticulture Commissioner, DAC&FW.
5. Managing Committee (MC) / Governing Council (GC)
6. (18 Members-10 Govts. Officials & 8 elected members from the society)
7. Chairman- Addl. Secretary, In-charge of Horticulture, DAC&FW
8. Member Secretary- Horticulture Commissioner, DAC&FW
9. Executive Director (Principal Executive Officer) (1) - In-charge
 - a. Administrative Wing
 - i. Section Officer, NBB (Accountant is looking after the work)
 1. Office Assistant(1)
 2. Accounts Section (Accountant) (1)
 3. Support Team (DEOs, etc.) (3)

- b. Technical Wing
 - i. Technical Experts/ Consultants

C. KHADI AND VILLAGE INDUSTRIES COMMISSION AND CBRTI

- 6.9 Khadi & Village Industries Commission with the inspiration of Rastrapita Mahatma Gandhi took the task of development of the beekeeping industry with a view to uplift the financial status of people living in extremely interior rural areas by introducing and popularizing modern beekeeping. The Khadi & Village Industries Commission's Act, Rules & Regulation indicates under the Schedule (Section 2h) that the "Beekeeping Activity" is the prime activity under Village industries.
- 6.10 KVIC's infrastructure includes the Central Bee Research and Training Institute, 125 Directly Aided Institutions, 19 State Bee Keeping Extension Center, 27 beekeeping clusters (under SFURTI/ KRDP), 79 technical experts (officials staff), 100 master trainers/ bee assistant, 37 state / divisional and sub office, 37 nodal office. In addition, 147 bee equipment manufacturers, 4 bee venom kit suppliers, 9 honey processing plant manufacturers and 57 colony suppliers throughout the nation support KVIC activities.
- 6.11 Action plan of honey mission 2018-19 under KVIC is to provide 1,31,000 Bee boxes to 13,100 beneficiaries for a total budget of Rs.63.35 crores and some of it has already been achieved. The list of beneficiaries is available in website for reference. The state and divisional offices of the KVIC, the state beekeeping extension centres (SBECs) and CBRTI perform the functions under KVIC. The CBRTI, Pune which is part of KVIC is carrying out research on beekeeping development.

SETTING UP OF BEEKEEPING DEVELOPMENT COMMITTEE

- 7.1 In spite of the involvement of many agencies, the outcome is not commensurate in achieving Sweet Revolution for food, nutritional and livelihood security through beekeeping. Moreover, a recent UN report warns that globally about 40% of the insect pollinators are facing extinction that can directly affect food production and nutritional security. Hence, there is a need for an Apex Body like the Economic Advisory Council to the Prime Minister (EAC-PM) to take lead in promoting and coordinating activities involved in Beekeeping industry so that “Sweet/Golden Revolution” in the country could be achieved and crop yield can be increased leading to fulfillment of the endeavor of Government of India in doubling farmers income by 2022. In this regard, it was decided to constitute “Beekeeping Development Committee” under the Chairmanship of Dr. Bibek Debroy, Chairman, EAC-PM (The Office Memorandum with composition of the committee is given in Annexure – 3)

A. TERMS OF REFERENCE:

- 7.2 The following are the terms of reference of the Beekeeping Development Committee
- i. To suggest measures for overall development of scientific beekeeping in the country and quality production of honey and other beehive products;
 - ii. To identify issues concerning various Ministries/ Departments/ Organisations/ Agencies involved in beekeeping and suggest measures to resolve them;
 - iii. To coordinate, promote, sponsor and support research, extension and development programme in beekeeping in the country as an essential input for agricultural production;
 - iv. To study the domestic & International markets/ trade for honey & other beehive products and suggest strategy for promoting production and marketing of quality honey and other beehive products in the country, in a Mission Mode approach;
 - v. To suggest post-harvest management measures and infrastructural development for beehive products viz. honey, bee pollen, propolis, bee wax, royal jelly, etc.; and
 - vi. Any other matter concerning with the development of beekeeping industry.

B. CONSTITUTION AND TERMS OF REFERENCE OF SUB-COMMITTEES 1 AND 2

- 7.3 During its first meeting held on 6th June 2018, this Committee decided to set up two Sub-Committees (Annex – 4).
- 7.4 The Sub-Committee: I was assigned to take up the following terms of reference of the main Committee:
- i. Suggesting measures for overall development of scientific beekeeping in the country and quality production of honey and other beehive products;
 - ii. Coordinating, promoting, sponsoring and supporting research, extension and development programme in beekeeping in the country as an essential input for agricultural production; and
 - iii. Suggesting post-harvest management measures and infrastructural development for beehive products viz. honey, bee pollen, propolis, bee wax, royal jelly, etc.
- 7.5 The Sub-Committee -2 was formed to take up the following terms of reference of the main Committee:
- i. Identifying issues concerning various Ministries/ Departments/ Organisations/ Agencies involved in beekeeping and suggesting measures to resolve them;
 - ii. Studying the domestic and International markets/trade for honey & other beehive products and suggesting strategy for promoting production and marketing of quality honey and other beehive products in the country, in a Mission Mode approach; and
 - iii. Examining the issues relating to legal framework, data collection, bee census, etc. and suggesting measures to remove impediments, if any and put in place a systematic/ scientific process.
- 7.6 The dates and locations of sub committee meetings are given in Annex – 5
- 7.7 The record notes of meetings conducted in various locations namely Delhi, Coimbatore, Ramnagar (Haryana), Imphal, Pune, Srinagar, and Odisha to cover different regions of India are given in annexures 6 to 14.

C. STAKEHOLDER CONSULTATION MEETINGS

- 7.8 In total, eight stakeholder consultation meetings were conducted at different locations. Of these, six meetings were of Sub-Committee: 1 and 2 meetings were of Sub-Committee: 2. The dates and locations of Sub-Committee: 1 meetings are as follows:
- i. On 18th July 2018 at Division of Entomology, Indian Agricultural Research Institute (IARI), New Delhi [covering Northern Region].
 - ii. On 5th September 2018 at Tamil Nadu Agricultural University, Coimbatore [covering Southern Region].
 - iii. On 4th October 2018 at Central Agricultural University, Imphal [covering North East Region].

- iv. On 16th October 2018 at Central Bee Research and Training Institute, Pune [covering Western Region].
 - v. On 15th November 2018 at SKUAST-Kashmir, Srinagar [covering J&K Region].
 - vi. On 5th December 2018 at Krushi Bhavan, Government of Odisha, Bhubaneswar [covering the Odisha State and Eastern Region].
- 7.9 The Sub-Committee:2 conducted two meetings at the following locations:
- i. On 12th September 2018 at Ramnagar, Kurukshethra.
 - ii. On 27-28 November 2018 (state-level beekeeping seminar was conducted) (at Dr YSR Horticultural University, Venkataramanagudem, Andhra Pradesh).
- 7.10 The meetings were held under the chairmanship of Dr. Bibek Debroy, Chairman, EAC-PM who evinced keen interest in knowing the problems in beekeeping in India and finding practical solutions. Some of the meetings were chaired by Shri Ratan P. Watal, Member Secretary who attended all the meetings and interacted with stakeholders of beekeeping industry in India. Shri K. Rajeswara Rao, Adviser, EAC-PM attended all the meetings and monitored the proceedings and interacted with the participants.

CHAPTER 8

ISSUES IDENTIFIED DURING STAKEHOLDER CONSULTATION MEETINGS

The issues identified in beekeeping during stake holder consultation meetings are listed below.

A. SUB COMMITTEE -1

8.1 ToR 1- Suggesting measures for overall development of scientific beekeeping in the country and quality production of honey and other beehive products

1. Honey bee hives are in short supply, hives are not to standard and lack of awareness of hive standards.
2. Honey bee colonies are of short supply among beekeepers, farmers and entrepreneurs.
3. Non-availability of genetically superior queens for increased honey production.
4. The farmers, beekeepers and enthusiasts do not get sufficient training from educational institutions to develop their skill and knowledge on beekeeping. Lack of scientific knowledge of modern beekeeping.
5. Wasp, bee mite & other diseases are problems that are not researched. Non availability of disease diagnosis and investigation centres.
6. Financial support for beekeepers is not available. Beekeeping is not economical for beekeeper, but beneficial to environment.
7. Most of the beekeepers are illiterate and primitive type of beekeeping still in vogue.
- In North Eastern India.

8.2 ToR 2 - Coordinating, promoting, sponsoring and supporting research, extension and development programme in beekeeping in the country as an essential input for agricultural production

1. The role of honey bees in agriculture (particularly in increasing productivity of vegetables, fruits, oilseeds and food grain through cross pollination) is being overlooked. Focus not given on managed bee pollination.

2. Beekeeper is not considered as a farmer unless he has land and is involved in agriculture. In reality, many beekeepers are landless and hence are not considered as beekeepers and government financial support does not reach him.
 3. Use of pesticides is a serious problem. Loss of bee colonies due to pesticide sprays in cultivated crops.
 4. Beekeeping equipment are not classified as agricultural implement and thus are not exempt from GST.
 5. Honey bee hives are supplied to beneficiaries under various government schemes who are not sufficiently trained to maintain hives and entire money and exercise goes waste as bees abandon the hives in short time.
 6. Loss of natural habitat of honey bees- mainly due to deforestation. Lack of bee pasturage – plants providing pollen and nectar are diminishing.
 7. Uprooting, cutting and burning of *Plectranthus rugosus* (Sollai) and *Acacia* which are important bee forage plants of the Kashmir region.
 8. Persisting drought conditions in some districts, particularly in south India.
 9. Newly developed crop varieties / hybrids that are poor in nectar source to bees (particularly where mustard, sunflower and eucalyptus are grown) in Northern India.
 10. Difficulties in the migration of honey bee colonies due to difficult terrain/ topography, particularly in North East India.
 11. Long rainy seasons weaken the colonies that need efficient management.- North East India.
 12. North East India is most suitable for organic honey production and beekeeping in general, but sufficient growth not seen in North East India.
 13. Geographical Indication (GI) can provide extra remuneration for honey in North East, Kashmir and South India (*A. cerana* honey) but not explored- North East India, Kashmir, South India, etc.
- 8.3 ToR 3 - Suggesting post-harvest management measures and infrastructural development for beehive products viz. honey, bee pollen, propolis, bee wax, royal jelly, etc.
1. Adulteration is a major problem in honey – honey is said to be adulterated with high fructose corn syrup (HFCS) or rice, tapioca, sugarcane and beet syrups that are cheap and resemble honey in physico-chemical properties, but does not possess the goodness and health benefits of honey.
 2. These adulterants are said to be either imported or manufactured in large volumes within the country.
 3. Owing probably to the rampant adulteration of honey with cheap syrups, the price of honey has fallen to a level (about Rs.70 per kg) with which regular beekeepers selling pure honey (the production cost itself is about Rs.200 per kg) cannot compete with respect to price.

4. In spite of the new standards for honey prescribed by Food Safety and Standards Authority of India (FSSAI), Ministry of Health and Family Welfare, GOI, during August 2018, the testing facilities / laboratories are not available in the country to implement these standards.
5. Standards fixed for honey are not sufficient enough to prevent adulteration. FSSAI new standards are different in Hindi and English .
6. Thus without proper price for honey, the real beekeeping industry is feeling the heat and has taken a beating.
7. Proper storage and marketing infrastructure is not available for honey and other hive products such as bees wax, royal jelly, pollen, propolis and bee venom.
8. Standards for royal jelly and beeswax available with FSSAI are not implementable due to lack of testing facilities/ laboratories.
9. Standards for pollen, propolis and bee venom are not available with FSSAI.

B. SUB-COMMITTEE - 2

8.4 ToR 4 - Identifying issues concerning various Ministries/ Departments/ Organisations/ Agencies involved in Beekeeping and suggesting measures to resolve them

1. Multiple organizations/ agencies are working in beekeeping viz., NBB, DAC&FW, ICAR-DARE, KVIC-MSME, EIC & APEDA- MoC&I, MoTA, FSSAI-MoH&FW, MoEF&CC, MoFPI, State Dept. of Agrl. Hort, Rural Development, Industry, SKVIBs ICAR-KVKs, SAUs in states, State Forest Dept. etc.- lacking coordination and as such no nodal agency at national / state level to coordinate beekeeping activities
2. National Bee Board under DAC&FW is functioning without direct budgetary support from Government of India.
3. Beekeeper registration is not done locally and there is lot of time delay and hardship to beekeepers for registration.
4. There is lack of scientific knowledge among the governmental agencies on beekeeping.
5. The material supplied by governmental agencies do not conform to standards.
6. The beneficiary selection by government departments are not systematic.
7. Honey bee hives are supplied to beneficiaries under various government schemes who are not sufficiently trained to maintain hives and entire money and exercise goes waste as bees abandon the hives in short time.

8.5 ToR 5 - Studying the domestic & International markets/trade for honey & other beehive products and suggesting strategy for promoting production and marketing of quality honey and other beehive products in the country, in a Mission Mode approach

1. Less domestic consumption of honey due to lack of awareness on goodness of honey/

health value of honey.

2. Prices are regulated by international market and hence no local control.
 3. Lack of infrastructural facilities at field/ district/ state/ national level for collection, storage, processing, marketing, etc. of honey.
 4. Unorganised sector and landless, marginal, small farmers and weaker sections are mainly involved in beekeeping who produce small quantities.
 5. No financial assistance for storing honey for getting better price in future leading to distress sale of honey. No price support at the time of low prevailing prices at beekeepers level.
 6. There are many persons involved in between producer and consumer namely, aggregators, traders, processors, packers, exporters, etc.
 7. The adulteration of honey and sale of fake honey reduces the demand of honey produced by beekeeper. Hence the price is not remunerative.
- 8.6 ToR 6 - Examining the issues relating to legal framework, data collection, bee census, etc. and suggesting measures to remove impediments, if any and put in place a systematic/ scientific process
1. Honey is not clearly defined.
 2. There is no scientific data on number of beekeepers and bee colonies in India.
 3. All Beekeepers are not registered. Registration process is inaccessible to beekeepers.
 4. No framework to trace honey to the producer (beekeeper in case of hive bees) or collector (in case of wild bees).
 5. Beekeepers face hardship at State Borders and Highways from police and other officials during migration of bee colonies which is an essential operation in beekeeping.
 6. Lack of coordination among beekeepers during migration of bee colonies leading to particular places resulting in overcrowding of apiaries.
 7. No financial support to beekeepers for migration and other management activities.
 8. No insurance coverage to beekeepers for loss during migration including theft of hives.
 9. There are no insurance policies to protect the honey bees and beekeepers from cyclone and flood. (Raised in Odisha and Kerala, but relevant to other locations as well).
 10. Banks do not finance / provide loan to beekeepers since they are landless.
 11. Forest Department do not allow sale of honey and bee produce in forest area even though produced from domesticated bees in hives.

12. In the Chapter – I “Preliminary” in the Indian Forest Act, 1927, vide clause no. (4) the details of forest produce have been mentioned with the title “Forest Produce” includes: sub clause (iii) of 4(b), among others, the honey and wax have been included. Imposing of the Duty on Timber and other Forest Produce (Chapter-VI), The Control of Timber and other Forest Produce in transit (Chapter-VII), Penalties and Procedures (Chapter-IX) & Subsidiary Rules (Chapter XII), etc. on forest produce have also been provided in this Act.
13. Honey produced by domesticated bees are not differentiated from forest produce & beekeepers/ traders of Honey & other beehive products, involved in promotion and trading/ marketing of honey are liable to be booked under Forest Acts /laws.
14. Honey manufacturers and packers are not mandated to disclose the sources (beekeepers or honey gatherers) from where they are procuring honey. Bee industry is driven by honey exporters (whose source of honey is unknown) and not by beekeepers.

CHAPTER 9

RECOMMENDATIONS OF BDC

9.1 Based on the constraints/issues identified during the stakeholders' consultation meetings, the Beekeeping Development Committee recommends the following for the development of beekeeping in India:

A. BEE KEEPING TO BE RECOGNIZED AS AN AGRICULTURAL INPUT

1. Honey bees and the organized pollination they ensure shall be recognized as an input in agriculture to enable high level of crop productivity and food security and prevent pollinator decline. Crop varieties of bee friendly crops such as mustard, sunflower, oilseeds, pulses, vegetables, etc., suitable for pollinators shall be encouraged. Bee friendly farm practices shall be popularised to stop bee poisoning from poisonous pesticides. Effective coordination between beekeepers and farmers to be ensured.
2. Further, bee friendly plant species in forest lands shall also be encouraged. Plantation of bee friendly flora shall be made in road sides/ railway lands/ banks of rivers/ waste lands/ forest, public lands, etc and women self-help groups shall be engaged in planting and maintaining the flora.

B. BEEKEEPER TO BE CONSIDERED AS FARMER

3. Beekeeper shall be considered farmer even if he is landless and government financial support meant for farmers shall reach him. Financial support shall be provided to beekeepers at every stage of beekeeping as beekeeping is not sufficiently remunerative to beekeeper, but indirectly increases crop productivity. Beehives and beekeeping equipment shall be classified as agricultural implement and thus be exempt from GST. Banks shall finance beekeepers even if he is landless based on other credentials. Insurance coverage to beekeepers for loss during migration including theft of hives and from cyclone and flood damages to be provided.

C. ESTABLISHMENT OF HONEY AND POLLINATORS BOARD OF INDIA (HPBI)

4. Institutionalising NBB, which is at present being handled by one or two officials of the Ministry of Agriculture as a part time job, by establishing a full-fledged authority/

agency which is necessary to synchronise the efforts of multiple agencies so that beekeeping and the overall development of apiculture in the country can get a boost. Such authority/agency shall be rechristened as Honey and Pollinators Board of India (HPBI) under the MoA&FW. Head of the other agencies shall be made as ex-officio Members of HPBI. HPBI shall have regional offices to cover all the four regions in the country. It can also have an office covering exclusively North Eastern states. The composition of HPBI and the organisational structure shall be worked out by the MoA&FW in consultation with the EAC-PM. Beekeeper registration shall be done locally and at the doorstep of beekeeper and there shall not be time delay and hardship to beekeepers for registration. Scientific data on number of beekeepers and bee colonies in India shall be recorded through registration of beekeepers. The State Horticulture Department shall be responsible at district and State level for registration of beekeepers, maintaining the records and reporting to regional Directors of the HPBI. More IBDC centres shall be funded by HPBI by identifying locations with beekeeping potential. Existing IBDCs shall be strengthened and manned by experts with sufficient training. Diversification of hive products such as royal jelly, beeswax, bee pollen, propolis, bee venom, shall be promoted and ensured by capacity building by HPBI with support of ICAR. Honey Industry personnel who are members of the HPBI shall also be involved in decision making with regard to beekeeping development in India to encourage PPP mode.

5. Availability of standard bee hives and live bee colonies with superior queens, disease free condition shall be ensured to farmers and beekeepers by HBPI. Research on these lines shall be done by ICAR.
6. NABARD through FSDF shall give priority to funding beekeeping activities in its major projects.

D. BEEKEEPERS' FEDERATIONS OR FARMER PRODUCER ORGANIZATIONS (FPOS)

7. Organising the beekeepers into effective entities such as Beekeepers' Federations or Farmer Producer Organizations (FPOs) like IFFCO for managing their inputs & equipments and marketing their produce. FPOs shall be set up in different regions of India including North east India. Common facilities such as honey processing units, hive distribution centres shall be set up under such federations. ICAR-KVKs, HPBI, NABARD and KVIC field centres shall be involved in creating FPOs which will collect honey from producers, and this will reduce the role of middlemen and also reduce the gap between price at point of collection from beekeeper and market price (which is wide at present).

E. HONEY PRICE STABILIZATION FUND

8. Since honey price is a major problem and is reported to be very low, a honey price stabilization fund with Rs.200 crore shall be made by the government of India (to start with) which can support farmers during uncertain price situation.

F. INDIAN INSTITUTE OF HONEY BEES AND POLLINATORS RESEARCH (IIHBPR) – A NEW INSTITUTE UNDER ICAR FOR STRENGTHENING BEEKEEPING AND POLLINATOR RESEARCH IN INDIA

9. ICAR shall upgrade its project coordinating Unit of AICRP on Honey bees and Pollinators, New Delhi to Indian Institute of Honey Bees and Pollinators Research (IIHBPR), New Delhi and shall continue to lead research on beekeeping and enhancing its existing sub-centres in SAUs to specialized regional centres of excellence namely *A. mellifera* centre in PAU, Ludhiana, *Apis cerana* centre in TNAU, Stingless bee centre in North East India in CAU, Imphal and bumble bee centre in Dr YSPUHF, Solan. More centres of excellence shall be designated based on need from time to time. ICAR shall also strengthen its existing sub-centres to regional research laboratories on honey bee pests and diseases diagnosis and management and other aspects of beekeeping.
10. Scientists of different disciplines namely plant breeding, entomology, economics, agricultural chemistry, etc. shall be encouraged to work in coordination to appreciate the role of honey bees and pollinators in agriculture and sustainable national development.
11. Apiculture as a subject shall be recognized by ICAR and it shall formulate syllabus for Masters Degree and Ph.D. in Agriculture/Horticulture, with specialization in apiculture. All the SAUs accredited by ICAR shall upgrade their apiculture units to apiculture departments and shall start teaching Masters in Agriculture/ Horticulture and Ph.D with specialization in Apiculture and ICAR shall ensure the same.
12. The Agriculture Scientists Recruitment Board (ASRB), MoA&FW shall recognize apiculture subject for conducting ARS and NET exams and recruit specialists in apiculture.
13. ICAR through its KVKs and centres in SAUs shall enhance providing periodical training to the beekeeping trainers. Capacity building in respect of bee health, management through short term and long term trainings to beekeepers must be ensured.

G. BEEKEEPING DEVELOPMENT BY KVIC AS A VILLAGE INDUSTRY

14. The activities of KVIC under MoMSME and KVIB under state governments shall synchronise with HPBI and engage in registration of beekeepers avoiding duplication of efforts, provide data relating to beekeepers, honey production, etc to it. HPBI shall maintain centralised data duly avoiding duplication/ multiplication. KVIC and KVIB shall impart training on beekeeping to entrepreneurs including women self-help groups and implement government schemes from the angle of village industry.
15. Census of beekeepers and bee colonies in India through registration shall be ensured by HPBI with support of other agencies namely MoS&PI, SDH, KVIC, KVIB etc.
16. CBRTI, Pune shall be strengthened to carry out research on honey and bee products, hive design and all aspects of beekeeping. CBRTI, Pune shall function in synchrony with ICAR-IIHBPR and avoid duplication of research activities. Hives and vehicles

suitable for migration of bee colonies shall be designed. State-wise and region-wise floral calendar shall be prepared by CBRTI and shared for the benefit of beekeepers and scientists. The floral calendars already prepared for every district and state of India shall be printed / published online for wide circulation among beekeepers of India.

H. STANDARDS FOR HONEY AND BEE PRODUCTS STORAGE, TESTING AND QUALITY CONTROL

17. FSSAI shall notify standards and specifications for honey and all other hive products produced by different honey bee species in consultation with concerned stakeholders including BIS and AGMARK. All the agencies shall adopt uniform standards and specifications. Quality based pricing of honey and other hive products shall be worked by FSSAI.
18. Proper storage, processing and marketing infrastructure from regional to national level for honey and other hive products such as beeswax, royal jelly, pollen, propolis and bee venom shall be ensured by HBPI and FSSAI. Internationally accredited Quality Testing Labs for Honey & other hive products shall be set up at regional and state-level and major beekeeping hubs and the labs shall charge a nominal testing fee from beekeepers and issue them Quality Certificate.

I. PREVENTION OF ADULTERATION OF HONEY AND BEE PRODUCTS

19. Honey (and bee products) sold in India or exported shall be traceable to a registered beekeeper or a registered collector (in case of rock bee honey). Honey without a known source shall not be treated as honey. This will prevent adulteration.
20. HBPI and FSSAI will ensure the traceability of honey source. Digital methods such as block chain shall be used for ensuring traceability of honey and bee products.

J. REDUCING HARDSHIP OF BEEKEEPERS DURING MIGRATION IN STATE BORDERS AND FORESTS

21. Beekeepers shall be protected from facing hardship at State Borders and Highways from police and other officials during migration of bee colonies which is an essential operation in beekeeping.
22. Forest Department shall not stop beekeepers from selling honey or beeswax produced from domesticated hive bees, the definition for the term 'forest produce' in the Indian Forest Act, 1927 is to be amended accordingly. The Indian Forest Act, 1927, has to be amended to exempt honey, beeswax and other products produced from domesticated hive bees namely *Apis mellifera*, *Apis cerana* and stingless bees from the term 'forest produce' mentioned in Chapter I (4). This will help in preventing imposing of the duty, penalties and procedures and subsidiary rules, etc. on hive honey and bee products produced from bee hives kept in forests.

K. HONEY BEES TO PREVENT HUMAN – ELEPHANT CONFLICT

23. Honey bees shall be kept in locations with elephant – human conflict so as to minimize effect of the conflict.

L. EXPORT PROMOTION OF HONEY AND BEE PRODUCTS

24. APEDA MoC&I shall help in export of honey with simplified procedures including honey from native bee species. The domestic players and exporters of honey shall be brought in line by APEDA for promoting honey export. An Export Promotion Council on honey and bee products shall be formed in consultation with MoC&I and HPBI.

M. PROMOTING HONEY AS HEALTHY AND NUTRITIONAL FOOD

25. Since per capita honey consumption in India is very poor, considering the health benefits of consuming honey, honey and bee pollen shall be included in mid day meals and child nutrition programmes, sportspersons and defense personnel with the support of National Institute of Nutrition, Hyderabad. Honey shall be promoted as healthy nutritional food through mass media.

N. COMMON CRITERIA FOR ALLOCATION OF FUNDS TO IBDCs, ETC.

26. Common criteria for allocation of funds for IBDCs and various schemes shall be followed.
27. There shall be system of evaluation of development projects and schemes implemented by the governmental agencies. An independent organization or a learned society shall be engaged in the monitoring and evaluation of projects implemented.

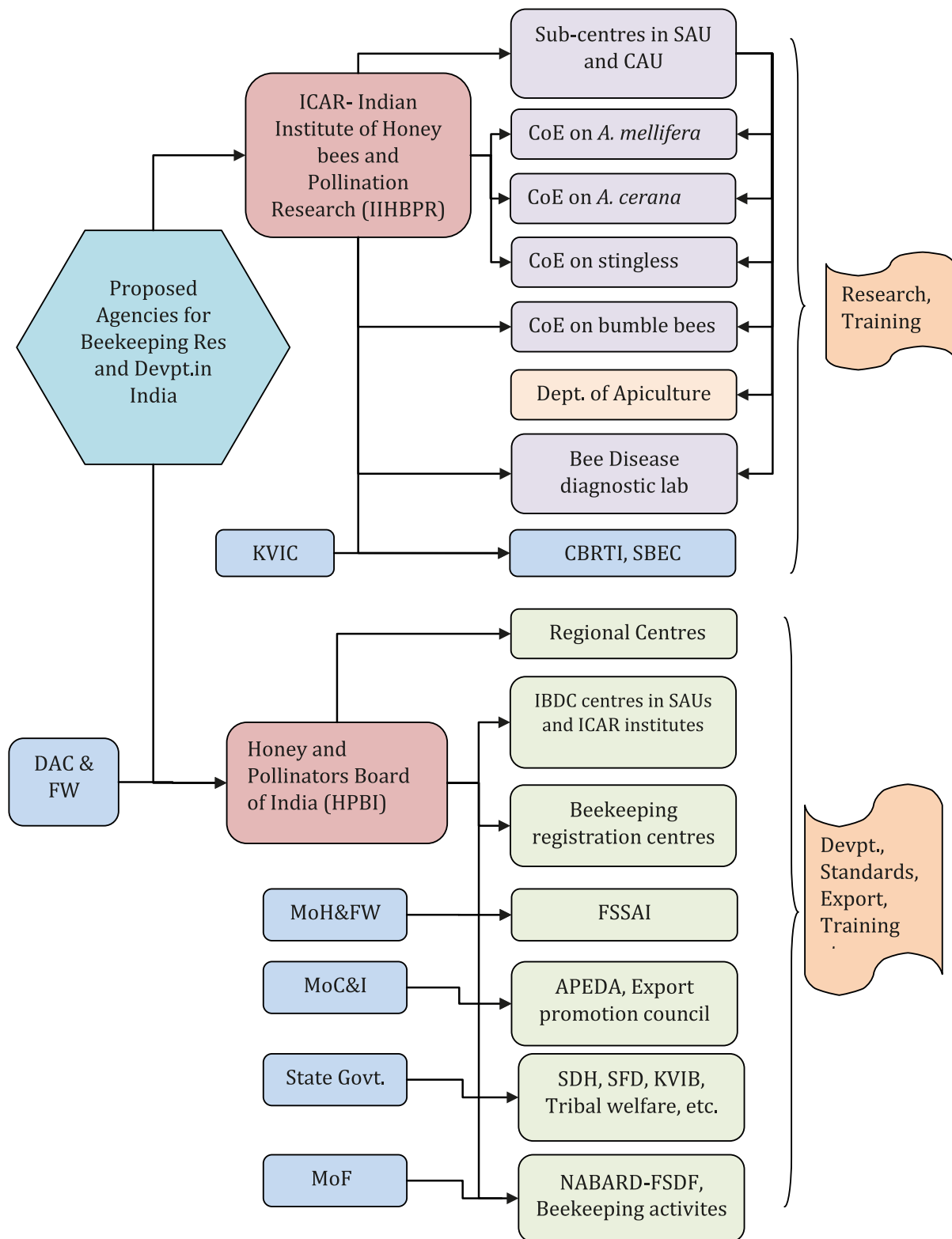


Fig. 42. Proposed role of organizations for beekeeping development and research in India

IMPLEMENTING AGENCIES

10.1 MOA&FW, SECRETARY DARE AND DG, ICAR

1. ICAR shall upgrade its project coordinating Unit of AICRP on Honey bees and Pollinators, New Delhi to Indian Institute of Honey Bees and Pollinators Research (IIHBPR), New Delhi and shall continue to lead research on beekeeping and enhancing its existing sub-centres in SAUs to specialized regional centres of excellence namely *A. mellifera* centre in PAU, Ludhiana, *Apis cerana* centre in TNAU, Stingless bee centre in North East India in CAU, Imphal and bumble bee centre in Dr YSPUHF, Solan. More centres of excellences shall be designated based on need from time to time. ICAR shall also strengthen its existing sub-centres to regional research laboratories on honey bee pests and diseases diagnosis and management and other aspects of beekeeping.
2. Apiculture as a subject shall be recognized by ICAR and it shall formulate syllabus for Masters Degree and Ph.D. in Agriculture/Horticulture, with specialization in apiculture. All the SAUs accredited by ICAR shall upgrade their apiculture units to apiculture departments and shall start teaching Masters in Agriculture/ Horticulture and Ph.D with specialization in Apiculture and ICAR shall ensure the same.
3. The Agriculture Scientists Recruitment Board (ASRB), MoA&FW shall recognize apiculture subject for conducting ARS and NET exams and recruit specialists in apiculture.
4. ICAR through its KVKs and centres in SAUs shall enhance providing periodical training to the beekeeping trainers. Capacity building in respect of bee health, management through short term and long term trainings to beekeepers must be ensured.
5. Honey bees and organized pollination shall be recognized as an input in agriculture to ensure high level of crop productivity and food security and prevent pollinator decline.
6. Crop varieties of bee friendly crops such as mustard, sunflower, oilseeds, pulses, vegetables, etc., suitable for pollinators shall be encouraged.
7. Bee friendly farm practices shall be popularized to stop bee poisoning from poisonous

pesticides

8. Availability of standard bee hives and live bee colonies with superior queens, disease free condition shall be ensured to farmers and beekeepers by HPBI. Research on these lines shall be done by ICAR.
9. Diversification of hive products such as royal jelly, beeswax, bee pollen, propolis bee venom, must be promoted and ensured by capacity building by HPBI with support of ICAR.
10. Organising the beekeepers into effective entities such as Beekeepers' Federations or Farmer Producer Organizations (FPOs) like IFFCO for managing their inputs & equipments and marketing their produce. FPOs shall be set up in different regions of India including North east India. Common facilities such as honey processing units, hive distribution centres shall be set up under such federations. ICAR-KVKs, HPBI and KVIC field centres shall be involved in creating FPOs which will collect honey from producers, and this will reduce the role of middlemen and also reduce the gap between price at point of collection from beekeeper and market price (which is wide at present).

10.2 MOA&FW, DAC&FW

1. Honey bees and organized pollination they ensure shall be recognized as an input in agriculture to ensure high level of crop productivity and food security and prevent pollinator decline.
2. Crop varieties of bee friendly crops such as mustard, sunflower, oilseeds, pulses, vegetables, etc., suitable for pollinators shall be encouraged.
3. Bee friendly farm practices shall be popularised to stop bee poisoning from poisonous pesticides.
4. Institutionalising NBB, which is at present being handled by one or two officials of the Ministry of Agriculture as a part time job, by establishing a full-fledged authority/ agency which is necessary to synchronise the efforts of multiple agencies so that beekeeping and the overall development of apiculture in the country can get a boost. Such authority/agency shall be christened as Honey and Pollinators Board of India (HPBI) under the MoA&FW.
5. Head of the other agencies shall be made as ex-officio Members of HPBI. HPBI shall have regional offices to cover all the four regions in the country. It can also have an office covering exclusively North Eastern states. The Directors of these HPBI and its sub-centres shall be filled by deputation of existing scientists preferably specialised in apiculture / entomology subjects from ICAR and SAUs.
6. The composition of HPBI and the organisational structure shall be worked out by the MoA&FW in consultation with the EAC-PM.
7. Beekeeper registration shall be done locally and at the doorstep of beekeeper and

- there shall not be time delay and hardship to beekeepers for registration.
8. Scientific data on number of beekeepers and bee colonies in India shall be recorded through registration of beekeepers.
 9. The State Horticulture Department shall be responsible at district and State level for registration of beekeepers, maintaining the records and reporting to regional Directors of the HPBI.
 10. More IBDC centres shall be funded by HPBI by identifying locations with beekeeping potential. Existing IBDCs shall be strengthened and manned with experts who are trained.
 11. Beekeeper shall be considered farmer even if he is landless and government financial support meant for farmers shall reach him.
 12. Financial support to be provided to beekeepers at every stage of beekeeping as beekeeping is not sufficiently remunerative to beekeeper, but beekeeping indirectly increases crop productivity.
 13. Beehives and beekeeping equipment shall be classified as agricultural implement and thus be exempt from GST.
 14. Banks shall finance beekeepers even if he is landless based on other credentials.
 15. Insurance coverage to beekeepers for loss during migration including theft of hives and from cyclone and flood damages to be provided.
 16. Proper storage, processing and marketing infrastructure from regional to national level for honey and other hive products such as bees wax, royal jelly, pollen, propolis and bee venom shall be ensured by HBPI and FSSAI. Quality based pricing of honey and other hive products shall be worked by FSSAI.
 17. Quality testing labs for honey & other hive products shall be set up at major beekeeping hubs in India identified by HPBI and the labs may charge a nominal testing fee from beekeepers and issue them Quality Certificate.
 18. Honey (and bee products) sold in India or exported shall be traceable to a registered beekeeper or a registered collector (in case of rock bee honey). Honey without a known source shall not be treated as honey. This will prevent adulteration.
 19. HPBI shall maintain centralised data of beekeepers, honey gatherers, bee colonies and bee products duly avoiding duplication/multiplication.
 20. HBPI and FSSAI will ensure the traceability of honey source. Digital methods such as block chain shall be explored for ensuring traceability of honey and bee products.
 21. There shall be system of evaluation of development projects and schemes implemented by the governmental agencies. An independent organization or a learned society shall be engaged in the monitoring and evaluation of projects implemented.
 22. Availability of standard bee hives and live bee colonies with superior queens, disease

- free condition shall be ensured to farmers and beekeepers by HBPI. Research on these lines shall be done by ICAR.
23. Honey Industry personnel who are members of the HPBI shall also be involved in decision making with regard to beekeeping development in India to encourage PPP mode.
 24. Diversification of hive products such as royal jelly, beeswax, bee pollen, propolis bee venom, shall be promoted and ensured by capacity building by HPBI with support of ICAR.
 25. Since honey price is a major problem and is reported to be very low, a honey price stabilization fund with Rs.200 crore shall be made by the government of India (to start with) which can support beekeepers during uncertain price situation.
 26. Organising the beekeepers into effective entities such as Beekeepers' Federations or Farmer Producer Organizations (FPOs) like IFFCO for managing their inputs & equipments and marketing their produce. FPOs shall be set up in different regions of India including North east India. Common facilities such as honey processing units, hive distribution centres shall be set up under such federations. ICAR-KVKs, HPBI, NABARD and KVIC field centres shall be involved in creating FPOs which will collect honey from producers, and this will reduce the role of middlemen and also reduce the gap between price at point of collection from beekeeper and market price (which is wide at present).
 27. Honey bees shall be kept in locations with elephant – human conflict so as to minimize effect of the conflict.

10.3 MOMSME, KVIC AND STATE KVIBS

1. The activities of KVIC under MoMSME and KVIB under state governments shall synchronise with HPBI and engage in registration of beekeepers avoiding duplication of efforts, provide data relating to beekeepers, honey production, etc to it.
2. KVIC and KVIB shall impart training on beekeeping to entrepreneurs including FPOs and women SHGs.
3. KVIC and KVIB shall implement government schemes on beekeeping from the angle of village industry.
4. State-wise and region-wise floral calendar shall be prepared by CBRTI and shared for the benefit of beekeepers and scientists. The floral calendars already prepared for every district and state of India shall be printed / published online for wide circulation among beekeepers of India.
5. CBRTI, Pune shall be strengthened to carry out research on honey and bee products, hive design and all aspects of beekeeping.
6. CBRTI, Pune shall function in synchrony with ICAR-IIHBPR and avoid duplication of research activities.

7. Hives and vehicles suitable for migration of bee colonies shall be designed.
8. There shall be system of evaluation of development projects and schemes implemented by the governmental agencies. An independent organization or a learned society shall be engaged in the monitoring and evaluation of projects implemented.

10.4 MOH&FW, FSSAI

1. FSSAI shall notify standards and specifications for honey and all other hive products produced by different honey bee species in consultation with concerned stakeholders including BIS and AGMARK. All the agencies shall adopt uniform standards and specifications.
2. Proper storage, processing and marketing infrastructure from regional to national level for honey and other hive products such as bees wax, royal jelly, pollen, propolis and bee venom shall be ensured by HBPI and FSSAI. Quality based pricing of honey and other hive products shall be worked by FSSAI.
3. Internationally accredited quality testing labs for honey & other hive products shall be set up at regional and state level and major beekeeping hubs in India identified by HPBI and the labs shall charge a nominal testing fee from beekeepers and issue them Quality Certificate.
4. Honey (and bee products) sold in India or exported shall be traceable to a registered beekeeper or a registered collector (in case of rock bee honey). Honey without a known source shall not be treated as honey. This will prevent adulteration.
5. HBPI and FSSAI shall ensure the traceability of honey source. Digital methods such as block chain shall be explored for ensuring traceability of honey and bee products.
6. Since per capita honey consumption in India is very poor, considering the health benefits of consuming honey, honey and bee pollen shall be included in mid day meals and child nutrition programmes, women health care, and health care of sportspersons, defense personnel with the support of National Institute of Nutrition, Hyderabad.

10.5 MINISTRY OF FINANCE

1. Beekeeper shall be considered farmer even if he is landless and government financial support meant for farmers shall reach him.
2. Financial support shall be provided to beekeepers at every stage of beekeeping as beekeeping is not remunerative to beekeeper, but indirectly increases crop productivity.
3. Beehives and beekeeping equipment shall be classified as agricultural implement and thus be exempted from GST.
4. NABARD through FSDF shall give priority to funding beekeeping activities in its major projects.

5. Banks shall finance beekeepers even if he is landless based on other credentials.
6. Insurance coverage to beekeepers for loss during migration including theft of hives and from cyclone and flood damages shall be provided.
7. Since honey price is a major problem and is reported to be very low, a honey price stabilization fund with Rs.200 crore shall be made by the government of India to start with which can support farmers during uncertain price situation.
8. There shall be a system of evaluation of development projects and schemes implemented by the governmental agencies. An independent organization or a learned society shall be engaged in the monitoring and evaluation of projects implemented.

10.6 MINISTRY OF LAW AND JUSTICE

1. Beekeepers shall be protected from facing hardship at State Borders and Highways from police and other officials during migration of bee colonies which is an essential operation in beekeeping.
2. Forest Department shall not stop beekeepers from selling honey or beeswax produced from domesticated hive bees, the definition for the term 'forest produce' in the Indian Forest Act, 1927 is to be amended accordingly. The Indian Forest Act, 1927, has to be amended to exempt honey, beeswax and other wax produced from domesticated hive bees namely *Apis mellifera*, *Apis cerana* and stingless bees from the term 'forest produce' mentioned in Chapter I (4). This will help in preventing imposing of the duty, penalties and procedures and subsidiary rules, etc. on hive honey and bee products produced from bee hives kept in forests.

10.7 MINISTRY OF ROAD TRANSPORT AND HIGHWAYS

1. Beekeepers shall be protected from facing hardship at State Borders and Highways from police and other officials during migration of bee colonies which is an essential operation in beekeeping.
2. Plantation of bee friendly flora shall be done in road sides/ railway lands/ banks of rivers/ waste lands/ forest, public lands, etc and women self-help groups shall be engaged in planting and maintaining the flora

10.8 MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

1. Forest Department shall not stop beekeepers from selling honey or beeswax produced from domesticated hive bees, the definition for the term 'forest produce' in the Indian Forest Act, 1927 is to be amended accordingly. The Indian Forest Act, 1927, has to be amended to exempt honey, beeswax and other wax produced from domesticated hive bees namely *Apis mellifera*, *Apis cerana* and stingless bees from the term 'forest produce' mentioned in Chapter I (4). This will help in preventing imposing of the duty, penalties and procedures and subsidiary rules, etc. on hive honey and bee products produced from bee hives kept in forests.
2. Further, bee friendly plant species in forest lands shall also be encouraged.

3. Plantation of bee friendly flora in road sides/ railway lands/ banks of rivers/ waste lands/ forest, public lands, etc and women self-help groups shall be engaged in planting and maintaining the flora.
4. Honey bees shall be kept in locations with elephant – human conflict so as to minimize effect of the conflict.

10.9 MINISTRY OF COMMERCE AND INDUSTRY, APEDA

1. APEDA MoC&I shall help in export of honey with simplified procedures including honey from native bee species.
2. An export promotion council on honey and bee products shall be formed in consultation with MoC&I and HPBI.
3. The domestic players and exporters of honey shall be brought in line by APEDA for promoting honey export.

10.10 MINISTRY OF WOMEN AND CHILD DEVELOPMENT

1. Since per capita honey consumption in India is very poor, considering the health benefits of consuming honey, honey and bee pollen shall be included in mid day meals and child nutrition programmes, women health care with the support of National Institute of Nutrition, Hyderabad.
2. Honey shall be promoted as healthy nutritional food through mass media.

10.11 MINISTRY OF YOUTH AFFAIRS AND SPORTS

1. Considering the health benefits of consuming honey, honey and bee pollen shall be included in the diet of sports persons with the support of National Institute of Nutrition, Hyderabad.

10.12 MINISTRY OF DEFENCE

1. Considering the health benefits of consuming honey, honey and bee pollen shall be included in the diet of defense personnel with the support of National Institute of Nutrition, Hyderabad.

10.13 MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION

1. Census of beekeepers and bee colonies in India through registration shall be ensured by HPBI with support of other agencies namely MoS&PI, SDH, KVIC, KVIB etc.
2. Honey (and bee products) sold in India or exported shall be traceable to a registered beekeeper or a registered collector (in case of rock bee honey). Honey without a known source shall not be treated as honey. This will prevent adulteration.

10.14 MINISTRY OF INFORMATION AND BROADCASTING

1. Honey shall be promoted as healthy nutritional food through mass media in coordination with HPBI.

