

**CHAPTER 2: MEASURES ADOPTED FOR APICULTURE
DEVELOPMENT IN WEST BENGAL**

2.1: INTRODUCTION

Bee a mysterious, hard working and social insect; holds an important place in human day-to-day lives. Sanskrit names for bee are: madhva, the honey-fly, madhu-pa, honey-drinker, madhu-kara, honey-maker, madhu-lih, honey-licker, and also Brahmara, the wanderer (Ransome, 2014, p. 44). Its main product is honey. The Sanskrit word for honey is madhu, which is etymologically identical with the Greek methu and the Anglo- Saxon medu, mead (Ransome, 2014, p. 44). Honey is a valuable thing with multiple usages. In addition, it is healthy and nutritious, and is often used for religious and medicinal purposes. In fact, honey has been an integral part of human civilization since ancient times. As such honey, Bees and Bee keeping have an ancient history.

2.2: HISTORY OF RELATIONSHIP BETWEEN BEE, HONEY AND HUMAN BEINGS

Bees came in this planet 560 lacs years before the appearance of man according to the assumptions of scientists (Yoirish, 1959, p. 66) (Ioyrish, 1974, p. 15). More recently a fossil female stingless bee was found in New Jersey amber from coniferous resin which is about 80 million years old. This bee is the oldest known specimen of social bees. A fossilized honey bee was found in 1993 from Germany. It dated to the middle Eocene, about 50 million years ago and was named *Eckfeldapis electrapoides*. The pollen collecting apparatus on the hind leg is similar to that of present-day *Apis*, with a corbicula and the characteristic single hair and the pollen load on one of its leg. Further, a fossilized piece of honey bee comb found near Kuala Lumpur in Malaysia could be identified by the size of its cells, as belonging to a nest of *Apis Cerana*. It is considered to be a few million years old, from late Tertiary or early Quaternary (Crane, 1999, pp. 7-9). Thus, it is obvious that bees have been integral part of human civilization from religion, politics, social, culture, food habits to economy and so on. The depiction of bees is also found in art and crafts, status and insignias as well as research and criticism. However, bees also have been given a negative connotation.

Interestingly, there are frequent references of bees and honey in Rig-Veda, Upanishads and Vedantas besides Bhagwatgita. The Budhist scriptures like Binoy Pithaka, Abhidamma Pithaka and Jataka tales gives due recognition to honey and bees. Similarly reference of bees and honey are found in Markandeya Purana, Atharva Veda, Raj Nighantu, Amar Kosha, Bharat Samhita and Arthasastras (Ghosh, Beekeeping In India, 1994, p. XIII). Few snapshots of these are depicted accordingly-

2.2.1: Religion

From almost 5000 years old ancient history of Egypt, it is evident that people considered bee as a symbol of protection, to save from “Poo”, the devil of darkness. In ancient Greece at Ephesus in the temple of Artemis, many bees were found in wall painting around the god. Priestesses were called “Melissai” (Fuiten, 2005, p. 20) which means bees. Honey was even used for holy sacrifices (Ioyrish, 1974, p. 15) (Dutta, 2001, pp. 13-14). In ‘Mahabharata’, we find description of Madhuban in Mathura and Brindaban where Lord Sri Krishna and his beloved Radha used to meet secretly. This Madhuban, it is believed, was maintained to tame bees for honey needed to make India a land of milk and honey (Ghosh, Beekeeping In India, 1994, p. 6). Similarly, in Sumer in Mesopotamia, honey was used as an offering before the god around 2000 B.C. Honey was used in rituals in Babylonians during the time of Hammurabi, around 1500BC (Crane, 1999, p. 172). Further, in Egypt honey was also used to feed the sacred animals (Ransome, 2014, p. 30). The great epic Ramayana describes the existence of Madhuban in Kiskindya maintained by the king Sugriva. This Madhuban was maintained exclusively for taming bees for honey needed by the king and his subjects. This means that there was an organized beekeeping in India even during 2000 B.C. (Ghosh, Beekeeping In India, 1994, p. 5). According to Hindu mythology, Kama, the Indian god of Love is also related to bees. Kama is depicted as carrying a bow, whose string is composed of a chain of bees, perhaps symbolizing that the arrows of the god cause pains, though they may be sweet ones (Ransome, 2014, pp. 44-45).

Honey also appears occasionally in burial rites. In the great funeral hymn of the Rig-Veda (x. 14) the priests are directed to pour honey to Yama, the god of Death (Ransome, 2014, p. 51). In the Laws of Manu (II. 29) honey is also shown to be used during the birth-rite for a male child wherein the child is fed with gold, honey and butter. Honey is also offered at a marriage ceremony as a symbol of sweet relationship between bride and groom. These customs still exists in different parts of the country (Ransome, 2014, pp. 49-50).

2.2.2: Food

It is said honey and milk can supplement each other. Milk is a complete food except that it does not contain iron. Thus taking milk with honey assures of all the nutrients (Ghosh & Ghosh, 1999, p. 32). Ancient text Rig Veda considered honey as important food needed for scholars. That honey was used for special practices is evident from that fact that in the Vedas, the chief officiating priest took the honey-cup, the ‘madhu-graha’, in a golden vessel and

deposited it in the middle of the soma-graha, and afterwards the cup of honey was presented to the Brahman (Ransome, 2014, p. 49). In the 'Grihya-Sutras', which are rules of Vedic domestic ceremonies, and also in the Laws of Manu, a householder is told to offer the 'madhuparka' (honey mixture) to certain visitors of importance (Ransome, 2014, p. 49).

Similar references can be found in ancient Egypt where Moses with his disciple left Egypt in search of 'promised land' which was considered as a land of milk and honey (Ghosh, *Beekeeping In India*, 1994, p. XIII). Likewise, Herodotus reported that palm trees in Babylonia was "Yield fruit from which the people make bread, wine and honey", but this "honey" was probably made from processed dates (Crane, 1999, p. 172). Honey is considered as a food even today in addition to its various usages (Gupta, Khan, Srivastava, & Goswami, 2014, p. 13).

2.2.3: Medicine and Preservation

According to Vedic literature both milk and honey are called "Amritas" (Ghosh & Ghosh, 1999, p. 32). Vatsayana in his famous book *Kama Sastra* considered honey as important ingredient for happy sexual life (Ghosh, *Beekeeping In India*, 1994, p. XII). As per the *Satapatha Brahmana*, honey was said to be the supreme essence of plants, so its consumption is equated with the absorption of the essence of the Vedas. As such consumption of honey by the students was given prime importance (Ransome, 2014, pp. 47-48). Similarly, honey was used as a medicine or its ingredients before 2000 BC in Sumer in Mesopotamia and in Babylonians around 1500BC (Crane, 1999, p. 172).

The curative value of the venom was known in Ancient Greece. Hippocrates, the "Father of Medicine," used it and called it "Arcanum- a very mysterious remedy," and he refers to it in his eight books on medicine. So does another famous physician, Galen, 130 A.D. and also the Roman, Pliny the Elder, in his *Natural History*, written in about 14 B.C. Even in the Koran, chapter XVI, 71, we find the reference of bee venom, which too was used for medical purposes (Broadman, 1962, p. 29).

Pyramids and obelisks, monuments of ancient Egypt, bear hieroglyphic description of the uses of honey as a food and medicine. The most ancient papyrus in Georg Eber's collection of papyri on medicine, written 3500 years ago, says that honey should be used in wound and to "induce urination and ease the bowels"(Yoirish, 1959, p. 66). In addition, honey heads the

list of medicines described in the Book of Chinese Medicine written 2200 years ago (Gupta, Khan, Srivastava, & Goswami, 2014, p. 13).

In Sumer in Mesopotamia, bees wax was used for 'lost-wax casting of metals' (Crane, 1999, p. 172). It is well known that the ancient Egyptians and Greeks used honey to embalm their dead bodies / mummies (Yoirish, 1959, p. 56). This can be substantiated by the fact that a jar of honey was found in the tomb of Queen of Egypt, which was buried over 3000 years ago. Interestingly, the honey found had not undergone any appreciable change in its chemical composition or in its original aroma (Sharma, 2006, p. 16).

It is also believed that the body of Alexander the Great who died during one of his campaigns, was immersed in a vessel of honey and was brought to the capital of Macedonia for burial. The same was done to the bodies of Agesipolis and Agesilaus, kings of Sparta and of Aristobulus, king of Judea. Apart from it, honey was also used by the ancient Greeks and Romans to preserve meat and to retain its natural flavour. A century and half ago, P. Sumarokov wrote- "a wonderful property of honey is that it protects plant, sap, roots, flowers, fruit and even meat from spillage" (Yoirish, 1959, p. 56). According to Aristophanes (Greek) (400 B.C) beeswax is good for multiple purposes, among which are metal protection, modeling, writing tablets, and for sealing love letters (Root, 1980, p. 18).

It is also believed that in Assyria (2050-1950 B.C.) during and after the period of Sargon-I, the bodies of the dead were smeared with wax and buried in honey (Root, 1980, p. 17). Similarly, it is contended that there was a custom in Maldah and Murshidabad region among the 'Nawab family' of Murshidabad who kept mango, especially mango named as 'Kahitur', submerged into honey so as to preserve it for the off-season; kings of the Gour empire too did the same.

2.2.4: Business, Taxation and Law

Honey owing to its immense value is often used as a means to pay tribute. Many jars of honey were paid annually by the chief of the Retenu (a people in Syria) to the great conqueror Thothmes III. It is mentioned in the Carnarvon tablet, which records the defeat of the Hyksos by Kamose that honey was one of the rations to be given to Kamose. In addition the priests required large quantities of honey for their religious rites. Taxes of honey were collected for this purpose, and some of the Pharaohs, especially Rameses III, presented enormous amounts of honey to the priests for their great festivals (Ransome, 2014, p. 30).

Around 1450 B.C. Tuthmosis III demanded honey from the citizens of Palestine and Syria during his campaigns. There was custom during 700 B.C. in Jerusalem where the citizens were to offer the first fruits of their corn, new wine, oil and honey and all the produce of their land to the kings (Crane, 1999, p. 174).

During 116-27 B.C. Varro (Roman scholar and author), mentions a certain Seius, who leased his hives at a yearly rent of 5000 pounds of honey, and so did Velanius. It is believed that Velanius earned at the average 10,000 sesterces a year (\$320). From Varro's writing it is evident that beekeeping was an established commercial practice in several countries bordering the Mediterranean Sea (Root, 1980, p. 19) (Eckert & Shaw, *Beekeeping : Sucess to Beekeeping*, 1960, p. 2)

1448-1482 A.D-during the reign of the Inca Tupac Yupanqui, conquered some sylvan savages, who though were poor, were asked to offer tribute to the king in the form of macaws, monkeys, honey, and beeswax (Root, 1980, p. 20). From Old Russian history it was found that Russia practiced apiculture and at the same time they exported honey and wax to Greece. In 911 A.D., an agreement was reached upon between Russian Prince Guleg and the Byzantine Empire regarding the sale of honey and wax. It is well documented that Prince Guleg gave honey, wax, and leather as a punishment of war to *the Byzantine Empire in 946 A.D. In imperialist Russia too, general people gave honey and wax to their ruler as a tax* (Dutta, 2001, p. 14) .

There is a mention in Holly "Koran" that Egypt is one of the countries where legislation and standard or codex, based on honey to be sold was found (Gupta, Khan, Srivastava, & Goswami, 2014, p. 28). Similarly, in Anatolia, the Hittite law formulated as early as 1500 B.C. laid down provisions regarding the protection of bee hives; they are –

There was a fine of 5 shekels of silver if one was found stealing bee hives as against 1+ shekels of silver, which was the previous penalty for such a crime.

Previously, if anyone was found guilty of stealing two or three beehives the culprit as a penalty had its own bee hives destroyed. However, the penalty under Hittite law was 6 shekels of silver. This was reduced to 3 shekels in cases where a hive without bees was stolen (Crane, 1999, p. 173) (Ransome, 2014, p. 55).

In India a law existed around 1000 B.C. which prohibited the Brahmans from selling or trading of honey and wax. It was a time when the caste system was in existence, and

Brahmans, the highest of the four castes, if found guilty of selling and trading honey and wax was degraded for seven days to a lower caste, that of the agriculturists (Ransome, 2014, p. 47). On the other hand, Laws of Manu, laid down a fix a certain amount of honey to be paid to the king by its subjects (Ransome, 2014, pp. 47-48). In Greece there existed laws in around 750 B.C. which fixed the number of bee hives one can keep. In addition over-stocking of the bee hives was prohibited (Root, 1980, p. 17). Further, during 640-599 B.C. according to Solon (Athenian Lawgiver) no new apiaries could be established within a distance of 300 yards from previously established apiaries (Root, 1980, p. 17) (Crane, 1999, p. 196) (Ioyrish, 1974, p. 188).

During 100 B.C.-In Roman Law, bees which were not enclosed in a hive, were legally considered master-less. Therefore, the bees, that were not hived, for instances in trees, were not considered to be one's own property. However, there was also a provision, which contended that who so ever hives them, becomes its owner (Root, 1980, p. 19). Similarly in 1740, Catherine the Great issued an ukase declaring that lands where trees with hives were not to be allowed to become private property (Ioyrish, 1974, p. 189).

Bees made it into the Russian law books in the twelfth century when the law codes, Russaya Pravda, were produced. In 1529 Lithuanian Statutes also laid down laws against bee-tree destruction (Gupta, Khan, Srivastava, & Goswami, 2014, p. 45).

2.2.5: Arts and Paintings

Mention has already been made about the art of the Artemis temple of ancient Greece at Ephesus. Around 15000 B.C. a rock painting of the Magdalenian period found on a rock of the "Cuevas- de-La-Arana" in Valencia, Spain also depicts the picture of honey hunting (Root, 1980, p. 17) (Khalifman, Bees; a book on the biology of the bee-colony and the achievements of bee-science, 1953, p. 11) (Yoirish, 1959, p. 66) (Crane, 1999, p. 43). A 'relief' found at Abusir in Egypt, highlights how the industry of beekeeping was advanced during the era and thus it can be deduced that it must have been practised for a very long period. This relief belongs to a series representing the seasons found in the Temple of the Sun, built about 2600 B.C. by Ne-user-re of the Fifth Dynasty. The hieroglyphs, which divide the "relief" into four groups, reading from left to right, have been translated as "Blowing or smoking, filling, pressing, sealing of honey" (Ransome, 2014, p. 26). Further, during 1580-1350 B.C. a wall painting of the 18th Dynasty in Thebes, Egypt, shows a man carrying

honeycombs and grapes, and bees hovering over the combs. The striping and coloring of these bees is identical to the Egyptian bee of today (Root, 1980, p. 17).

A 'Register of rock art relating to bees and honey hunting' set up in 1985 recorded 118 rock arts on bees and honey hunting in 18 countries by 1997. Probably more than twice this number are known but not yet recorded in the register. Representations in Asia show *Apis Dorsata* nests, with paintings at 12 sites in India and 2 in Srilanka and 1 site in Bhutan (Crane, 1999, p. 37).

A decorative vase of 540 B.C. found in the Etruscan city of Volei, shows mythical honey hunters in a cave on Mount Dikte, Ctrete and which now is found in British Meseum (Crane, 1999, p. 46). Similarly, a gold pendant was found in 1930 at Mallia, in a burial site used between about 2000 and 1700 B.C. where the two insects, most probably bees are shown face to face (Crane, 1999, pp. 198-190). It seems that the early Merovingians were fascinating by bees. Discovered in Merovingians tomb of Childeric I, the father of Clovis, in 1653 by a mason working on the reconstruction of the church of Saint-Brice in Tournai, were several gold items including 300 golden bees (Gupta, Khan, Srivastava, & Goswami, 2014, p. 43).

For the indigenous people of Nicaragua, the bee symbolized sunlight. A magnificent sculpture of this can be found near Managua in the Laguna Asososca. This sculpture represents a bee placed next to the famous feathered snake Quetzalcoatl. (Gupta, Khan, Srivastava, & Goswami, 2014, p. 54)

2.2.6: Naming, Symbol, Status and War

About 3500 BC or even earlier, when the two countries of Upper and Lower Egypt were united under one ruler, bee was used as the hieroglyph to denote the king of Lower Egypt. This bee hieroglyph, denoting the king of Lower Egypt, is found on inscriptions from the First Dynasty down to the Roman period, that is, for about four thousand years (Ransome, 2014, p. 24). Even the cartouche containing the name of the king is preceded by a bee (Root, 1980, p. 17).

As mentioned earlier the Sanskrit word for honey is "madhu", from here the gods Vishnu, Krishna, and Indra were called Madhava, the nectar-born ones, and their symbol is the bee. Vishnu is represented as a blue bee, resting on a lotus flower. Krishna, the popular incarnation of Vishnu, is often represented with a blue bee on or above his forehead. Vishnu, as one of the great Indian triad, Brahma, Vishnu, and Siva, is generally known as the

“Preserver” and Siva as the “Destroyer”. However, when Siva is calm and quiet he is designated as “Madheri,” meaning Shiva’s destructiveness subsides when associated with bees and thus is represented in the form of a triangle with bee in it (Ransome, 2014, pp. 44-45).

Nepoleon Bonaparte (1769-1821) saw elements of the state in the bee colony. In drawing up the code Napoleon, he made use of the ideal order, collectivism and total commitment to the queen of the bee (empire). He adopted the bee as his emblem and during his reign the curtain of the Grand Opera was decorated with a bee pattern (Ioyrish, 1974, p. 190). (Gupta, Khan, Srivastava, & Goswami, 2014, p. 43)

The country Malta, in Roman times was called Melita (bee) and represented a very important area for honey production. Still these places bear maltese names clearly linked to the beekeeping developments of that time. Imgiebah (apiary) and Wied- il-Ghasel (the valley of honey) are places where precious remnants of a millennial past of beekeeping activities have been unearthed (Gupta, Khan, Srivastava, & Goswami, 2014, p. 48).

Honey can also be used as a lethal weapon. In the far distant past, when Pompey and his cohorts (about 1000 men) were travelling through mountains, Heptakometes, an enemy of Pompey, placed poisonous honey along the route. When the soldiers of Pompey ate the honey they became senseless and were ambushed and killed (Root, 1980, p. 20).

It took seven years from 1842 to 1849 for British Army with first class arms to occupy Bondh (coastal Orissa) to fight with primitive army of Kandha tribe, who fought with bows and arrows. One of the major reasons for this debacle of British army was because Kandhas attacked them with their tamed bees including rock bees which are yet to be tamed by modern world. This shows, that Kandhas tamed the bees not only for honey but they had capacity to use the bees for various other purposes. Unfortunately these tribesmen of Orissa have now forgotten the method of controlling bees due to the influence of modern development (Ghosh, Beekeeping In India, 1994, p. 6).

2.2.7: School

In more recent times, beekeeping flourished in the Austrian Empire during the reign of Maria Theresa (1717-1780). On her direct instructions the post of teacher of beekeeping was instituted in many Austrian towns and the best experts on bees were invited to apply for the same. It is also believed that the famous Slovenian bee-master Anto Jansa was summoned from Krajna and appointed to the Vienna School of Apiculture, receiving the title of Imperial

Bee-master. In fact, the Vienna School was the only school in the whole Europe where studies and research on bees and beekeeping were undertaken (Ioyrish, 1974, p. 189), (Gupta, Khan, Srivastava, & Goswami, History of Beekeeping in Developing World, 2014, p. 44). In fact, beekeeping was introduced as part of the curriculum of the “Georgicon”, the first agricultural college in Europe, in 1789 (Gupta, Khan, Srivastava, & Goswami, 2014, p. 44). Similarly, in his native village of mitchenki, in Russia, Prokopovich founded the first school of apiculture in 1828 (Ioyrish, 1974, p. 194) (Khalifman, Bees; a book on the biology of the bee-colony and the achievements of bee-science, 1953, p. 287). Further, in 1770-1771, on the instructions of Catherine the Great, the two ablest students of the Smolensk Seminary (Borodovsky and Kaverznev) were sent to study the theory and practice of beekeeping under the eminent beemaster Schirach in Upper Lusatia. (Ioyrish, 1974, p. 189)

2.2.8: Misconceptions

Stinging insects, like mosquitoes, ants, and bees, are said to come from hot moisture. However, there was a common belief during ancient times that pious animals that fast will reach heaven and would be reborn as bees on earth. The meaning of this is obscure, unless we think of the bee as a “soul.” In parts of India it is still believed that the souls of the departed enter into flies and bees (Ransome, 2014, pp. 47-48). Likewise in Assam the spirit of men are said to become honey bees (Bodenheimer, 1951, p. 234). Further, According to the ancient Laws of Manu, Honey was so valued that if a man stole it, in his next life he would become a gadfly (Ransome, 2014, p. 48).

In ancient India, there existed superstitions connected with bees. For instance, swarming was anxiously observed, for if by chance a swarm went into a house, it denoted misfortune, which could only be averted by burning some pieces of the ‘Udumbaba-tree’. In the ‘Grihya-Sutras’ it has been mentioned that if bees make honey in his house, man must fast and sacrifice 108 pieces of Udumbaba wood smeared with curds, honey, and ghee, and recite: “No harm to us in our offering.” Likewise, to dream of bees resting on a building denoted that some evil would befall. There also existed a belief that one would either soon lose his life or suffer some great misfortune if one dreamed of bees entering the house. As a part of after-death ritual in some parts of China, the beehives are rotated around in a circular manner around the dead body of the owner. However, Chinese till now consider swarms to be lucky (Ransome, 2014, pp. 51-54).

There is a passage in a later Veda which says– “all the bees go up when the king-bee goes up and they settle down when the king-bee settles down”. This means that there was a misconception that male bees were leaders of the swarm (Prashnopanishad 2.4) (Crane, 1999, p. 559). Similar misconceptions existed in 460-370 B. C. For instance, Democritus, a Greek philosopher, as well as other Greek writers before Aristotle, believed that bees were the reincarnation of Oxen. This can be understood from Democritus instructions on ways obtain bees. Democritus’ instructions are here presented in some detail, he says, “Kill an ox and confine it in a one room building, closing every opening with clay. Then open the building on the 32nd day and you will find it full of bees, crowded in clusters on each other, and the horns and the bones and the hair and nothing else of the bullock left. He says indeed that the ‘kings’ are produced from the brain, but other bees from flesh. Kings are also produced from spinal marrow. But those that are produced from the brain are superior to the others in size and beauty and in strength (Root, 1980, pp. 17-18).

Further, during 372-287 B.C., Theophrastus (Greek) wrongly wrote that nectar is collected from air not from flower (Dutta, 2001, p. 16). Yet another misconception existed during 62-113 A.D. Pliny, a Roman author wrote in his books that bees are born from dead oxen and that the larvae were collected by the bees from the flowers (Root, 1980, p. 19), meaning that larvae and bees are two different beings. Similarly, in 1679 AD Moses Rusden (England), who was Bee Master to King Charles II wrote in his book ‘Further Discovery of Bees’ that worker bees collect “the actual corporal substance of the young bees” from the flowers.

2.2.9: Research

In 400 B.C., however, the queen bees started gaining prominence over the king bees which prior to that were considered to be the mainstay of the swarm. For instance, Xenophon (Greek Historian), describes the activities of the queen comparing her work with that of a housewife: ‘While she stays in the hive, she does not allow the bees to get lazy, but sends out those who have to work outside, observes what they bring in, takes it and stores it until it can be used. When the time comes she divides it fairly well to each one. Further she supervises the building of the combs in the hive and she sees to it that they are constructed well and pretty and that the brood is reared in an orderly way.’ Thus Xenophon considers the queen as the guiding brain of the hive (Root, 1980, p. 18).

Aristotle (384-322 B.C.), considered as the sun of ancient apiculture, was the first to deal with the bees in a scientific way. He did not accept anything without testifying it. His

writings contain an immense quantity of accurate observations on bees. However, he had limitations due to the fact that the hives he used had no movable frames (only top bars) and therefore he was compelled to remove from the hive permanently each comb that he examined. Because of this lacuna he was unable to examine certain phases of the life of the bees (Root, 1980, p. 18) (Ioyrish, 1974, p. 187).

On the other hand, Virgil, Roman poet (70-19 B.C), recommended clipping the wings of the ruler so that the swarm does not leave the hive. He spoke about shade and wind protection. He also stated that the noise of cymbals is to be used to settle the swarms. This belief has persisted in many countries till today (Root, 1980, p. 19). Butler, who wrote the “Feminine Monarchie”, was the first among bee writers to affirm in 1609 that the “King-bee” was really a queen. This he contended after he had verified that it was the queen that deposit eggs. “Jan Swammerdam” (1637 - 1680) of Holland, substantiating Butler, proved for the first time that a bee colony was headed by a female, the queen. Till that time it was believed that a bee king ruled the bee hive. In fact, Swammerdam described the gender of each of the castes in the colony and studied the male and female reproductive systems in the bees (Suranarayana, 1994) (Ioyrish, 1974, p. 190). Further in 1788, Ernst Spilzner (Germany) observed that when a worker honeybee returned to the hive with a load of nectar, it performed certain movements, which are now known as the dances of the bees (Root, 1980, p. 21).

2.3: DEVELOPMENT OF APICULTURE ACTIVITIES IN THE WORLD

Apiculture has a long history and the industry is in a continuous evolution. According to human need this industry appears in various forms on the way of the journey of human life. Human being also changes and develops the industry day by day. Few evidences of development are given in the following Table 2.1 accordingly –

**TABLE 2.1: FEW EXAMPLES OF DEVELOPMENT OF APICULTURE
ACTIVITIES AROUND THE WORLD**

Time	Who/Where	Events
15000 BC.	A painting of the Magdalenian period (Palio-lithic Era) found on a rock of the “Cuevas- de-La-Arana” in Valencia, Spain.	The oldest record on beekeeping. The painting shows two men climbing up long ropes; probably woven of sedge-grass, to a small natural hole in a cliff, evidently intended to represent the dwelling of a swarm of bees. One of the men is shown taking the honeycomb out of the hole and placing it in a basket. Bees are shown flying around. (Root, 1980, p. 17) (Crane E. E., 1975, p. 21)
3000 BC	Ancient Egypt	Written records indicate that migratory beekeeping up and down the Nile River in Ancient Egypt was a common practice. Since the season in upper Egypt was earlier than in lower Egypt, beekeepers took their bees up the Nile after the honey was harvested. The hives were placed on rafts from which the bees flew to gather honey. Then the rafts were moved farther down the Nile to a point where there were more flowers. (Root, 1980, p. 17) (Crane E. E., 1975, p. 28) (Eckert & Shaw, Beekeeping : Sucess to Beekeeping, 1960, p. 2)
about 2400 B.C	Ancient Egypt	Ancient Egypt’s beekeepers had a wide knowledge as that recorded by Greek and Roman writers more than 2000 years later (Crane, 1999, p. 559).
1750 B.C.	Aryan people	The Veda, sacred Sanskrit books of Aryan people who moved into the Indus and Ganges valleys around 1750

		B.C. contain passages which have sometimes been interpreted as indicating quite advanced knowledge about bees (Crane, 1999, p. 559).
1500 and 1000 B.C.	Vedic Ariyans	The earliest is the Rig-Veda which consists of hymns collected in oral form probably between 1500 and 1000 B.C. and addressed to deities, the Asvins. It is interpreted by Dave the Asvins as 'presiding over two kinds of Indian bees, their honey, and the art of bee culture as practiced by the Vedic Ariyans'. (Crane, 1999, p. 559)
384-322 B.C.	Aristotle (Greek) The Sun of ancient apiculture	Discovered the 'Foul Brood' disease of bees. (Root, 1980, p. 18). He was the first to record division of labour among worker bees. (Eckert & Shaw, Beekeeping : Success to Beekeeping, 1960, p. 2)
300B.C.	Ancient Greece	The earliest surviving accounts of honey bees and their activities were written (Crane, 1999, p. 559).
Between 250 and 150 B.C.	Mago	Mago in Carthage wrote about beekeeping in his highly regarded book on agriculture (Crane, 1999, p. 559).
116-27 B.C.,	Varro	Varro gives a long list of the materials of which hives are made, including those made of osiers and round in shape (perhaps skeps), those made of wood and bark, those made of hollow trees, of earthen-ware, and last of all those made of reeds. (Root, 1980, p. 19)
60 A.D	Columella (Roman practical writer on agriculture).	He also wrote on bees. The writers set out to tell the beekeeper what will be required in his apiary, and

		what he should do each season. (Root, 1980, p. 19) (Eckert & Shaw, Beekeeping : Sucess to Beekeeping, 1960, p. 3)
950 A.D	By order of the Emperor Constantine VII of Byzantium	A series of books named “Geoponica” was written, which is an encyclopedia of the available information to that time. It contains considerable information on beekeeping. (Root, 1980, p. 20) (Ioyrish, 1974, p. 189) (Eckert & Shaw, Beekeeping : Sucess to Beekeeping, 1960, p. 4)
1590 A.D	J and Z Janssen (Holland)	Invented the miscroscope, enabling man to examine structures so far invisible to the unaided eye. (Root, 1980, p. 20)
1609 A-D	Butler (An English beekeeper)	Wrote the “Feminine Monarchie” who was the first among bee writers to affirm in 1609 that the “Kingbee” was really a queen, because he had seen her deposit eggs. (Root, 1980, p. 21) (Dutta, 2001, p. 17)
1621 A.D	America	The European hive bee was introduced into America. (Suranarayana, 1994)
1652 A.D	Mewe (Great Britain)	Constructed hives of wood, with movable top bars. (Root, 1980, p. 21)
1683 A.D	John Houghton (England)	Invented a movable-frame hive but his bee spaces were too wide. The frames soon would become immovable. (Root, 1980, p. 21)
1711A.D.	Maraldi (France)	Invented a single-comb observation hive having glass sides. (Root, 1980, p. 21)
1712-1777 A.D.	Peter Rychkov	He was the first man in Russia to record the observations of the life of a bee colony in an improved transparent hive. (Ioyrish,

		1974, p. 191)
1758 -A,D	Carolus Linnaeus	Published the 10th Edition of Systema Naturae. In this he used for the first time the binominal system of nomenclature. The honeybee was named Apis mellifera. (Root, 1980, p. 21)
1771 AD	Janscha (Austria) (the royal beekeeper of Maria Theresa)	Solved the mystery of the mating of the queen, by his discovery that the mating occurs away from the hives. (Root, 1980, p. 21)
1787 A.D	Huber (Switzerland)	Noted the flight of virgin queens and their return to the hive with evidences of mating. (Root, 1980, p. 21) (Suranarayana, 1994)
1789 A.D	Huber	Blind Huber invented the Huber hive. (Root, 1980, p. 21) Huber's book hive triggered interest in the moveable frame hive. (Suranarayana, 1994) (Ioyrish, 1974, p. 191) (Gupta, Khan, Srivastava, & Goswami, 2014, p. 4)
1790 A.D.	Della Rocca (Italian)	In his book on bees, mentions bar hives as in vogue in the Islands of the Greek Archipelago, where he lived for many years. (Root, 1980, p. 21)
1814 A.D.	P I Prokopovich	Invented the moveable frame hive, named Collapsible hive, an invention that was great importance as it served to rationalize beekeeping and promoted productivity and profitability. (Suranarayana, 1994) (Gupta, Khan, Srivastava, & Goswami, 2014, p. 46) (Ioyrish, 1974, p. 193) (Dutta, 2001, p. 18)
1817 -1902 A.D.	Charles Dadant	Invented Dadant hive. (Ioyrish, 1974, p. 196)
1818 A.D.	Svinin	Wanted to prove that beekeeping can be possible in cold region even in North

		pole. (Dutta, 2001, p. 18)
1814-1858 A.D.	Karl Roulier	Invented Pavilion hive. (Ioyrish, 1974, p. 195)
1820 A.D.	Australia	The European hive bee was introduced into Australia. (Suranarayana, 1994)
1822-1884 A.D.	Johan Gregor Mendel, the father of genetics	Made cross breeding between different kinds of bees (Ioyrish, 1974, p. 197). (Dutta, 2001, p. 19)
1832-1901 A.D.	Ivan Lyubarsky	Pioneer in the use of bee venom taken from bee stings. (Ioyrish, 1974, p. 199)
1802-1873 A.D.	Guse V.E.	Recommended artificial breeding of queen. (Ioyrish, 1974, p. 194)
1811-1906 A.D.	Johann Dzierzen	As one of the innovators of nineteenth century, he perfected the design and production of beehives, systems of management and husbandry, stock improvement by selective breeding, honey extraction and marketing. (Gupta, Khan, Srivastava, & Goswami, 2014, p. 6)
1851 A.D.	L.L.Langstroth (in United State)	Invented self-spacing movable frame and discovered the Bee-space, on which the modern movable frame hive depends. He observed that if a small space was left between the framed combs and the walls of the hive the bees would leave it clear, not attempting to bridge the gap with wax. The moveable frame meant that bee colonies could now be controlled to new degree. (Gupta, Khan, Srivastava, & Goswami, 2014, p. 5)
1857A.D.	Johannes Mehring (a carpenter and beekeeper of Germany)	Comb foundation sheet (Suranarayana, 1994) (Ghosh, Beekeeping In India, 1994, p. 10)
1864A.D.	Samuel Wagner of U.S.A.	Invented improved and

		perfected of above Comb foundation-sheet. (Suranarayana, 1994)
1865A.D.	Major D. Franz Hrusdchka of Venice	Invented the centrifugal honey extractor. (Suranarayana, 1994) (Gupta, Khan, Srivastava, & Goswami, 2014, p. 46)
1870A.D.	Moses Quinby	Invented the bellows bee smoker that facilitated easy handling of bee hives. (Suranarayana, 1994) (Ioyrish, 1974, p. 212)
1877A.D.	Bingham	Invented a bee smoker and advertised it was improved in several ways. (Crane E. , 1999, p. 345)
1879 A.D.	Norman Clark and J.G.Carey	Introduced Cold-blast smoker. (Crane E. , 1999, p. 346)
1846-1916	Theophile Tseselsky	Invented Slavonic hive. (Ioyrish, 1974, p. 202)
1846-1918	Gilbert Doolittle	Invented a method of breeding queen bees by transferring the larvae to specially constructed containers, for which he made the prototype. (Ioyrish, 1974, p. 202)
1886	Karl von Frisch	Wrote a book entitled ‘Language of Bees’ where he revealed the meaning of dances of bees. (Dutta, 2001, p. 19)
1890 A.D.	J.E.Crane	Introduced another Cold-blast smoker. (Crane E. , 1999, p. 346)
1905	Frank Benton	Invented a portable and transportable queen brood chamber. He send bees and Caucasian queen bees from Baku to the USA and made known to all. (Ioyrish, 1974, p. 204)
1915	K. von Frisch	Discovered that bees distinguish between colours, science then the entrance to

		hives standing in arrow have frequently been painted in different colours so that bees can find their own colony with greater ease and speed. (Gupta, Khan, Srivastava, & Goswami, 2014, p. 5)
1933	Tasmania Government	Apiaries Act came into effect on 31 st October 1933 (Gupta, Khan, Srivastava, & Goswami, 2014, p. 27)
1870-1941	Edmund Alphandery	Wrote dictionary on apiculture, d'Apiculture. The first film about bees was shoot in the early days of cinema on his bee firm. (Ioyrish, 1974, p. 209)

2.4: DEVELOPMENT OF APICULTURE ACTIVITIES IN INDIA

Fixed-comb hives of an assortment of types and sizes were used for primitive beekeeping that supposedly continued over the centuries. Watt's Commercial Products of India (1908) recorded that wild colonies were captured and kept in primitive hives in different parts of India. Swarming was controlled by clipping the wings of the queen bees. Log hives of varying sizes were made out of tree trunks and after filling with bee colonies, were kept generally vertically, or sometimes horizontally. Wooden and tin boxes of different shapes and sizes were also used often. They were either kept on ground or hung to beams at the roofs of the house verandas. By far the commonest form of fixed frame traditional hives was the wall hives. Adequate space was left in the walls of houses for the purpose of accommodating swarms. Clay pots or pitchers and cylindrical jars were also commonly used, particularly in the tropical southern states of the country. As an improvement in the pot-hives, a smaller flat pot was kept above the main pot, to be used by the bees to store honey. Like the box hives, these were also kept on trees, in the house yards or hung from roofs in verandas. Sometimes cylindrical mud hives were set horizontally at the walls. However, baskets plastered with cow dung and mud and inverted wooden bowls or cups were sometimes used as hives.

During the time of Moorecraft, beekeeping in Kashmir was apparently more advanced as compared to other countries and Kashmir honey was comparable to the best honey produced in Narbonne, France. Bee keeping was advanced in the old Punjab province too. In the

province bees were kept in a semi-domesticated state in the Kulu valley, Kangra valley and the Murree hills. Similarly, in the United Provinces, wall recesses, were kept in a specially constructed hive called jalas or jalotas at the walls of houses. Such practices were common in Almora, Nainital, Dehradun and Garhwal districts. In the Khasi and Jainta hills of Assam, beekeeping was more advanced and bees were domesticated. Likewise, in the Mahabaleshwar plateau and valleys (Maharashtra), bees were attracted to decoy hives, such as old dealwood boxes, kerosene tins or earthenware pots. However, in the old Madras Presidency, the indigenous method of keeping bees in clay pots was practised in the hill and forest areas in Kanara and Nilgiris. In the Coorg and Malabar regions and in the Mysore Province also similar methods were common, but in Mysore the yields were very low. In all these cases harvesting honey was similar to that used for wild bee hives. Honey was extracted out of the combs after driving away the bees by smoke. Such honey was often contaminated by brood juices and bee parts and as such was of poor in quality (Suranarayana, 1994).

With the coming of modern practices and techniques in beekeeping a tremendous development was witnessed in the field of apiculture. The employability of such modern techniques entailed the beekeepers to collect honey without destroying the hives. Not only that, such hives could be used year to year, and more importantly, the beekeepers could monitor the activities of the bees inside the hive. Moreover, such hives are mobile and thus could be shifted to places where the blossom season is active. This led to the increase in the 'active seasons' of honey collection and thus leads to the increase in the production of honey. Another important technique which gradually evolved is the separation of the queen bees which in turn led to the increase in the number of colonies. Similarly with the innovation of the honey extractor, the problem of impure contamination was addressed. Many countries of the world adopt this technique for sustainable development.

Modern beekeeping started in Afghanistan in 1940. During the same time in Bangladesh (which was still part of India), keeping or rearing bees in wooden hives started, probably during the self reliant movement of Mahatma Gandhi. In 1950s experimental beekeeping was done in the tea growing areas of Sylhet district. *Apis Mellifera* was introduced in Bangladesh in the year 1992 on experimental basis and now in many parts of the country it is gaining popularity because of higher honey yield. Bhutan has highest forest cover (72% of the total geographical area) and thus, is suitable for commercial beekeeping. Beekeeping with *Apis Mellifera* has been in practice in the centrally located Bumthang Azongkhang district after it

was introduced in the year 1986 by Mr. Fritz Maurer. Work on introduction of European honey bees started in Burma in 1979 under Dr. Cyprian Zmarlicki. Besides honey hunting of the little honey bee, *Apis Florea*, and the giant honey honey bee *Apis Dorsata*, honey is also harvested from beekeeping of *Apis Mellifera* which have been introduced and *Apis Cerena* which are native to the region.

The western bee was not introduced into China until the beginning of the twentieth century but China has recently wrestled the ascendancy as the foremost producer of honey from the Soviet Union. Modern beekeeping has been established in Malaysia since 1981. Nepal is known for its floral diversity and as such has a great potential for the large scale development of beekeeping. *Apis Mellifera* has been introduced into Nepal from India during 1990, currently this bee species is flourishing well in low hill and plain areas. *Apis Laboriosa* is found in high mountain areas. Beekeeping and honey production in Nepal is still under developmental stage.

The modern beekeeping is still in its nascent stage in Pakistan. The beekeepers in Pakistan have limited knowledge of modern beekeeping management practices. The first introduction of *Apis Mellifera* into Pakistan (then part of India) was attempted during 1908 but in vain. During next 60 years, further 15 attempts were made to introduce *Apis Mellifera* from various places in Europe and Russia to Pakistan. These attempts too could not bore the desired results. Finally during 1977-79, colonies from Australia were successfully established at the National Agriculture Research Centre (NARC) in Islamabad. Similarly, in Philippines modern beekeeping was introduced by Americans in 1913. The Systematic beekeeping activities in Sri Lanka commenced in the year 1940. In the context of Japan, all of its colonies are populated with Italian bees. Royal Jelly production technique mainly developed in Japan during 1940s. Japan, in fact, is still one of the largest producers of Royal Jelly.

Beekeeping sector developed at a rapid pace after World War II in Turkey. In fact, the climate and environmental conditions of Turkey are very favourable for the practice of bee rearing. However, organized beekeeping initiatives started only in 1978 in the region. When it comes to New Zealand, the first honey bees were brought there by English missionaries in 1839. The first successful importation of English Black Bees into Tasmania was in 1831. Ethiopia is a potential beekeeping giant. Over three million traditional hives and one million farmer-beekeepers are in Ethiopia. However, only 30 beekeepers are using modern hives in Ethiopia at present though the modern beekeeping started much earlier in the region.

Madagascar is one of the few countries in the world where man lives in day to day contact with bees. Modern beekeeping in Austria was evident before 1865 as Franz Von Hruschka of Austria invented the first honey extractor that used centrifugal force, which is still the method used today. Simple log hives have been found in Peat box of Germany that date 1500 years old or more. The conventional beekeepers of Hungary harvested honey by killing their bees and cutting out the combs of the skep. On the contrary Samuel Tessedik (1974) harvested honey using modern techniques and without killing the bees and without cutting the combs. Beekeeping in Poland has a long tradition dating back to the days of Slavic tribes, i.e. the thirteenth century. In the nineteenth century, forest beekeeping gradually evolved into modern beekeeping.

In the nineteenth century the first signs of modern beekeeping in apiaries of Russia began to take shape and they invented hives with removable wooden frames. In fact, it was Petro Prokopovych who invented the dismantlable frame bee-hive 800 years ago. It was landmark in the history of beekeeping and it began the era of rational beekeeping in a sense that it made it possible to control the bees and to actively influence the course of the development. Rational beekeeping of Slovakia actually started in the late eighteenth century and since then it has been integral part of modern agriculture. Interestingly, there is no indigenous honey bee in America and it was Spanish who imported the first European honey bees to South America in 1538. In Argentina, beekeeping began in earnest and continues today in its central part, in the province called “La Pampa”. It started in the 1930s when Raimundo Urmente Gil began to manage a small apiary near the town of Victoria. The activity slowly grew through the 1950s and 1960s. Bee queens from Italy were first imported in 1967 and in 1970s which led to the burgeoning of beekeeping practices.

The 1980s saw dramatic increase in beekeepers. It was golden era where colonies made between 80 to 90 kgs of honey during the long growing season. The craft began in Brazil in 1830s, with the first honey bees being imported from Europe by immigrants. Hernan Cortes in 1519 provides the first records of stingless beekeeping in Mexico. The first European honey bees arrived in North America in 1622 at Virginia colony. European missionaries probably were the first to introduce honey bees into the Pacific in the mid nineteenth century. The first attempt to introduce bees in Hawaii was made by the Royal Hawaiian Agricultural society in 1851 on the island of O’ahu which failed. However, the successful introduction of honey bees took place in 1857 (Gupta, Khan, Srivastava, & Goswami, 2014, pp. 1-62) .

These adaptations of modern beekeeping techniques in world has also motivated and triggered the development of modern beekeeping in India. Achievement of which are depicted accordingly in the table 2.2 below –

TABLE2.2: DEVELOPMENT OF MODERN BEEKEEPING IN INDIA

Develop mental Foot-print	Who	Events	Time	Where
1	Mr. John Douglas, an employee of the Telegraph Department, Calcutta,	Kept the Indian bees in modern moveable frame hives. This was the first attempt of modern beekeeping in India.	1882	in Calcutta (Suranarayana, 1994)
2	Sir Louis Dane	Moveable frame hives had been introduced and by this he had taken the first attempts of modern beekeeping in that state.	Around 1882 after Mr. John Douglas	Punjab (Suranarayana, 1994)
3	Government of India	Published A Collection of Papers on Beekeeping, summarizing the information on the status of beekeeping in different provinces.	1883	India (Suranarayana, 1994)
4	Sir Louis Dane	He was the first man to keep bees in modern hives in the Kulu valley.	1882 - 1884	Kulu valley (Suranarayana, 1994)
5	Mr. John Douglas	Published a book entitled “A Handbook on Beekeeping in India”, recording his experiences,	1884	Calcutta (Suranarayana, 1994)

		and making a strong plea to take up beekeeping in the country, of which he saw great scope.		
6	Jesuit Fathers	Some pioneering work on domestication of the Indian bees was initiated.	late 1880s	South India (Suranarayana, 1994)
7	Shri D.K. Butani	Some beekeeping work was later undertaken by the College of Agriculture, Poona, under him	1846	the College of Agriculture, Poona (Suranarayana, 1994)
8	Rev. Fr. J. Castets, a professor of St. Joseph's College, Trichinopoly	a book were published in the first contribution on the Indian honey bees	1893	India (Suranarayana, 1994)
9	The apiculturist of the Agriculture Department	The first attempt to start beekeeping in the then Travancore state was made	1904	Travancore state (Suranarayana, 1994)
10	Sir Louis Dane	Kept bees in modern hives.	1908	Simla (Suranarayana, 1994)
11	Sir Louis Dane	Under his patronage, the first beekeepers' association in India was formed in Simla	1909	Simla (Suranarayana, 1994)
12	Rev. Fr. L.V. Newton, Professor of History and Economics	Designed an indigenous moveable frame hive for Indian bee. The hive made exclusively for the Indian bee was at once welcomed in south India,	1909	South India (Suranarayana, 1994) (NPCS Board of Consultants & Engineers, 2015, p. 2)

		where it became popular and later came to be known as the Newton hive.		
13	Imperial Entomologist	Took up work on the Indian and Italian bees.	1907-1919	Pusa (now in Bihar) (Suranarayana, 1994)
14	Imperial Department of Agriculture,	"Beekeeping", written by C.C. Ghosh was published as its Bulletin No. 46.	1915	Pusa (Suranarayana, 1994)
15	Dr. Kunhi Kannan, Entomologist	Introduced modern beekeeping and popularise beekeeping.	1915	The Department of Agriculture, Mysore. (Suranarayana, 1994)
16	Sir Louis Dane	Under his patronage, 'A Guide to Beekeeping in the hill districts of Northern India' was published	1916	Simla (Suranarayana, 1994)
17	Rev. Fr. L.V. Newton, Professor of History and Economics	Made efforts to popularize modern beekeeping in the area	1911 - 1917	South India (Suranarayana, 1994)
18	Travancore Government	After failure of the above project, following the work of Fr. Newton, the Travancore Government took up development of beekeeping.	1917	Travancore state (Suranarayana, 1994)
19	Mr. Baldry	Tried rearing of European bees in at Nasrapur and Mahabaleshwar and was able to keep the Italian	1920s	In the then Bombay Presidency (Suranarayana, 1994)

		bees successfully for about six years.		
20	Dr. D. Spencer Hatch	Established the Y.M.C.A. Rural Demonstration Centre	1924	Martandam (now in Tamilnadu) (Suranarayana, 1994)
21	The agricultural departments of Mysore and Madras	Took up work of propagation of modern beekeeping	1925 - 26	Mysore and Madras (Suranarayana, 1994)
22	Rev. Fr. L.V. Newton, Professor of History and Economics	Made efforts to popularize modern beekeeping in the area	1926 - 27	Shembaganur, near Kodaikanal, Pulney Hills. (Suranarayana, 1994)
23	Y.M.C.A. Rural Reconstruction Centre	Beekeeping work was taken	1927	Doddaballapur near Bangalore.
24	Dr. T.C. Razdan	Though modern bee hive appeared in early 1920s, the first sustained effort to introduce moveable frame hives was made.	1927	Jammu and Kashmir (Suranarayana, 1994)
25	Dr. D. Spencer Hatch	Brought six bee colonies from Italy. Due to the shortage of pollen sources in these areas, all the colonies soon perished.	1928	Trivandrum, later shifted to Ramnathapuram, Coimbatore (Madras) and Marthandam. (Suranarayana, 1994)
26	Sri Swami Shambhavananda of Sri Ramakrishna Ashram	Initiated modern beekeeping	1928	Ponnampet, in the then Coorg Province (Suranarayana, 1994)
27	Department of Agriculture, the Agriculture College, Coimbatore	An apiary was started	1931	Department of Agriculture, the Agriculture College, Coimbatore (Suranarayana, 1994)

28	Mr. A. Litenkov (a Russian)	The first commercial bee farm with modern equipment was established at Raison. This farm was later taken over by the government and was shifted to Katrain.	1932	Punjab (Suranarayana, 1994)
29	The Government of Punjab	Selected a research scholar and sent him to the U.S.A. for training.	1933	Punjab (Suranarayana, 1994)
30	The Department of Agriculture, Mysore.	A departmental Bulletin No. 10 on Beekeeping was published	1933	Mysore (Suranarayana, 1994)
31	Gandhiji	The All India Village Industries Association formed and took up beekeeping as one of its activities, in several parts of the country.	1935	Wardha (NPCS Board of Consultants & Engineers, 2015, p. 4)
32	Department of Agriculture, the Agriculture College, Coimbatore	Published Bulletin No. 23 on Bees and Beekeeping in South India	1936	Coimbatore (Suranarayana, 1994)
33	S. Ramachandran	Published a book Beekeeping in South India	1936	Coimbatore (Suranarayana, 1994)
34	Mr. C.R. Thompson	Experimented with rearing of bees of the Italian and Carniolan races of Apis mellifera brought by him from Australia. But these did not survive.	1936	Apiculture Section, Department of Agriculture, Travancore state (Suranarayana, 1994)

35	Shri N.P. Mullick	Established a bee farm.	1936	Kulu (Suranarayana, 1994)
36	Under the guidance of Mr. F.L. Brayne, Commissioner, Rural Reconstruction Department.	The research scholar started experimental apiaries.	1936	Nagrota (Kangra) and Raison (Kulu) (Suranarayana, 1994)
37	Beekeepers	The country's first beekeepers' co-operative society was formed	1936	Virajpet (Suranarayana, 1994)
38	With the efforts of Pt. Muttoo and others	An All India Beekeepers' Association was formed in 1937 at Jeolikote	1937	United Provinces (Suranarayana, 1994)
39	The Government, Department for Rural Development	Established apiaries at Jeolikote (Nainital).	1938	United Provinces (Suranarayana, 1994)
40	Mr. John Dasiah	published a Hand Book on Bee Culture	1938	Y.M.CA. Rural Demonstration Centre (Suranarayana, 1994)
41	Rural Reconstruction Department.	The Raison Station was shifted to Katrain (Kulu). Later a Beekeeping Demonstration Station was established in Simla	1939	Kulu and Simla (Suranarayana, 1994)
42	The Department of Agriculture	Modern beekeeping started	1939	Nagpur, Central Provinces, (Suranarayana, 1994)
43	All India Beekeepers' Association	The Association started its official organ, the Indian	1939	United Provinces (Suranarayana, 1994)

		Bee Journal. The Association also arranged annual beekeeping conferences and organized other measures to popularize modern beekeeping and encourage honey industry.		
44	Dr. T.C. Razdan	Took up a state level programme for beekeeping development.	1939	Jammu and Kashmir (Suranarayana, 1994)
45	Shri P.S. Acharya of Kunderu	Propagated modern beekeeping on commercial lines	late 1940s	Krishna district (Suranarayana, 1994)
46	The Government, Department for Rural Development	Established apiaries at Karmi (Almora)	1940	United Provinces (Suranarayana, 1994)
47	Shri C.V. Shivapuri, Superintendent, State Gardens and State Beekeeper, Alwar	Kept bees in modern hives for the first time in the region.	1941	Rajputana (Suranarayana, 1994)
48	Sree Ramakrishna Dham	Started modern beekeeping work in the hill areas, established an Apiary-cum-Training Centre with one colony and took up beekeeping extension programme in the localities where Sree Ramakrishna Mission had Centres. Within about seven years	1943	Almora, U.P (Suranarayana, 1994)

		after establishment, the Apiary could increase the colony number to 100 and later mission sent to the Ramakrishna Mission Centres at Shyamlatal (Almora District), Allahabad, Lucknow and Calcutta.		
49	The Imperial Council of Agricultural Research	Established a Central Beekeeping Research Station at Lyallpur, but in the Partition, Lyallpur and the Research Station went over to Pakistan.	1945	Punjab (Suranarayana, 1994)
50	Shri A.I. Ghatge	joined to look after the apiary work of The All India Village Industries Association (association's first established apiary commencing modern beekeeping)	1945	Maganwadi, Wardha (Suranarayana, 1994)
51	Mr. H. Toucher	started keeping modern hives in McCluskiegunj on the Ranchi plateau	1945	Behar (Suranarayana, 1994)
52	Shri A.I. Ghatge	Took up work on domestication of rockbees and contributed a great deal to our knowledge on the rockbees.	1946	The Maganwadi Apiaries, Wardha, of the All India Khadi and Village Industries Association. (Suranarayana, 1994)

53	Dr. K.A. Rahman, Shri Sardar Singh, and Shri P.L. Sharma, of the Entomological Laboratories, Punjab Agricultural College and Research Institute, Lyallpur,	Led by these three personnel three demonstration centres were started in the plains of Punjab, at Gudaspur, Jullundur and Ambala.	1945-50	North Indian (Suranarayana, 1994)
54	The Government of Bhopal State	Initiated a beekeeping extension scheme.	1946	Tamot (Suranarayana, 1994)
55	Bee-keepers'	The Nagpur Bee-keepers' Co-operative Society was formed	1947	Dharampeth, Nagpur (Suranarayana, 1994)
56	Shri P.S. Acharya	Wrote a book in Telugu on honey bees and beekeeping, and popularized use of honey as a nutritive and valuable natural food.	1948	South India (Suranarayana, 1994)
57	Shri S.G. Shende (under the leadership of)	The Bombay Village Industries Committee initiated beekeeping development programme	1948	Mahableswar (NPCS Board of Consultants & Engineers, 2015, p. 4)
58	Shri S.K. Kallapur, after his appointment as Chief Organizer for the Karnatak region of the Bombay Village Industries Committee	Took up work on rockbee honey industry. The work consisted of developing techniques for hygienic collection of honey, maximising honey output and	1951-52	Dharwar. (Suranarayana, 1994)

		minimising loss of life of bees.		
59	Inaugurated by Shri Morarji Desai.	Thereafter the Apicultural Research Laboratory was established	1952	Mahableshwar (NPCS Board of Consultants & Engineers, 2015, p. 5)
60	Government of India	The (KVIC) an Autonomous Statutory Body was established by an Act of Parliament in 1956 to plan, organize and implement the programmes for the development of Khadi and Village Industries.	1957	Bombay (NPCS Board of Consultants & Engineers, 2015, p. 2)
61	The Apiary, Sree Ramakrishna Dham	Published a pictorial manual of the life cycle of the honey bee and scientific beekeeping.	1958	U.P (Suranarayana, 1994)
62	The Apiculture Laboratory, Mahableshwar	approached Directorate of Marketing, Nagpur (AGMARK) and Indian Standards Institute to take up grading of honey	late 1950s	Nagpur (NPCS Board of Consultants & Engineers, 2015, p. 9)
63	KVIC with the help of Maharashtra State Khadi and Village Industries Board	Established Central Bee Research and Training Institute (CBRTI)	1962	Pune (NPCS Board of Consultants & Engineers, 2015, p. 5)
64	Dr. A.S. Atwal, Mr. O.P. Sharma, Dr. N.P. Goyal and their colleagues	Succeeded in introduction of European honeybees in the plains	1960 – early 1970	Punjab (NPCS Board of Consultants & Engineers, 2015, p. 7)
65	Beekeepers of Kanyakumari District of	Migrated few bee colonies to Rubber	Around 1969-70	Tamil Nadu and of Kerala

	Tamil Nadu and of Kerala state.	Estates and obtained surprisingly higher honey production.		(NPCS Board of Consultants & Engineers, 2015, p. 9)
66	KVIC	To ensure payment of a reasonable price to the producers, the KVIC stepped into the honey marketing activity and a minimum price for honey was fixed for the first time in the country.	1971-72	Throughout India (Suranarayana, 1994)
67	The National Commission on Agriculture	Wrote in its final report to the Government of India one Chapter on Apiculture and made many recommendations for the development of beekeeping in India.	1976	Government of India (NPCS Board of Consultants & Engineers, 2015, p. 6)
68	CBRTI	Broad areas of research and training were identified for implementation at eight different co-operating Centres under All India-Co-ordinated Research Project on Honeybee Research and Training with main co-ordinating centre located at CBRTI, Pune.	1981	Pune (NPCS Board of Consultants & Engineers, 2015, p. 6)

69	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	Govt. of India (National Bee Board, 2015)
70	The Ministry of Agriculture, Govt. of India	the National Bee Board as a Registered Society under Societies Registration Act, XXI of 1860	2000	Delhi (National Bee Board, 2015)
71	National Horticulture Mission (NHM)	Beekeeping has been included as a supplemental activity under National Horticulture Mission (NHM) for promoting cross pollination of Horticultural Crops	2005	Across the India (National Bee Board, 2015)
72		The National Bee Board (NBB) was reconstituted with the main objective of 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.	2006	Across the India

73	NBB	Signed a MOU and has entered into a tripartite agreement for development of integrated beekeeping activities in the Mahakaushal region in Katni District Madhya Pradesh, with <i>M/s.</i> Dabur India Ltd., Ghaziabad and the Covenant Centre for Development, Madurai, Tamil Nadu	2014	New Delhi (National Bee Board, 2015)
74	Horticulture Mission for North East and Himalayan State (HMNEH) and NHM	Implemented schemes for beekeeping	2014	Selected states of India (National Bee Board, 2015)

Development of modern beekeeping in India coincided with the increased activities under Freedom Struggle Movement. Mahatma Gandhi realized that economic development, in any country with a majority of population in poverty, could be possible through the encouragement and revival of the labour intensive traditional cottage industries. In other words, according to Gandhi, economic independence was a pre-requisite for political independence. He, therefore, linked the programme of rural uplift with the Freedom Movement. Khadi, the coarse cotton cloth manufactured with traditional hand-spinning and hand-weaving technologies, was adopted as a symbol of this programme. The objectives of this programme were rural upliftment, self-reliance, production of daily needs of the people indigenously or by using indigenous resources and technologies. This in turn would avoid dependence on and exploitation by, the foreign government and would also decentralize production system. Further, it would also generate employment opportunities especially to the poor. Consequently, apiculture gained importance as it eminently met all the above requirements. The industry in addition needed little investment, in terms of locally available resources and skills, and gave nutritive and medicinal products tapping natural material like nectar and pollen of plants that were being wasted in forests and farms. Beekeeping,

therefore, was included as one of the activities in the Constructive Programme. Gandhiji started many rural industries in his Sewagram Ashram near Wardha. Several Sevadai volunteers and Freedom Fighters took their training in these industries at the Ashram. An apostle of peace and non-violence, Gandhiji liked modern apiary technique of extracting only the surplus honey, without destroying bees. He considered it a sin to use honey extracted by the primitive method and thus advocated his followers to train villagers in modern beekeeping.

The All India Village Industries Association formed under Gandhiji's inspiration in 1935, took up beekeeping as one of its activities, in several parts of the country. It was under the aegis of Mahatma Gandhi's, that for the first time, beekeeping came to be accepted as an industry worthy of encouragement. The All India Village Industries Association established the first apiary commencing modern beekeeping at Maganwadi, Wardha, then in the Central Provinces. Shri A.I. Ghatge joined the Association in 1945 to look after the apiary work. Several freedom fighters were trained in his Ashram at Wardha in the art of maintaining honeybee colonies. These Freedom fighters from all over the country initiated beekeeping industry in their respective States. All these efforts, however, were restricted to small pockets only. (Suranarayana, 1994)

After independence, India concentrated on rapid industrialization with the hope that the benefits would be distributed to the common masses. Though 80 percent of the population lives in rural India and depend on agriculture, only elites got benefited from industrialization. In this way poor rural people continued to be poor. Hence, India gave more emphasis to agriculture in the second phase of its development plan. Consequently huge investments were made in agricultural research and extension and India became self-sufficient in food production. Special efforts were also made to develop various agriculture based industries like dairy industries, fish-farming poultry-farming, sericulture and apiculture. However, out of them apiculture industry received inadequate attention (NPCS Board of Consultants & Engineers, 2015, p. 1).

2.4.1: Khadi and Village Industries Commission and Apiculture

After independence, Government of India decided to revive various traditional industries and an All India Khadi and Village Industries Board was constituted to undertake this work. The task of development of beekeeping industry was also entrusted to this Board. This Board was later reconstituted as Khadi and Village Industries Commission (KVIC) a statutory body of

Ministry of Industries. The (KVIC) an Autonomous Statutory Body was established by an Act of Parliament in 1956 to plan, organize and implement the programmes for the development of Khadi and Village Industries. With the promulgation of Act, no. LXI of 1956, the Khadi and Village Industries Commission came into being in April, 1957. It was only after the establishment of KVIC at Central level and Khadi and Village Industries Boards at State level that beekeeping industry received serious attention for its development in a coordinated manner throughout the country. This was to be done through well-knit organizations like Central Bee Research & Training Institute (CBRTI), State Khadi and V.I. Boards, Beekeepers' Co-operative Societies, State Beekeeping Extension Centres (SBEC), KVI Registered Institutions under Khadi, KVI Registered Institutions under VI and registered public Institutions etc. (Khadi & Village Industries Commission, 2015) (NPCS Board of Consultants & Engineers, 2015, pp. 2-3)

2.4.2: Beekeeping Directorate under Khadi and Village Industries Commission

Since beekeeping industry was included in the schedule of KVIC, the Commission established Beekeeping Directorate with adequate staff at its Headquarters in Bombay. Further network of technical and extension staff were instituted in all states reaching through Districts to potential villages. The Beekeeping Directorate had evolved about ten different patterns of assistance for providing financial assistance to Beekeepers' Cooperatives, Institutions and individuals. Some of the patterns of assistance are (1) Establishment of beekeeping sub-stations (2) Model apiary-cum-nursery, (3) Migration of bee colonies, (4) Construction of honey house (5) Purchase of beekeeping equipment (6) Training in beekeeping, etc. Every year developmental plan for each state was finalized and financial as well as technical assistance was provided by the KVIC to State Boards, Institutions, or Co-operatives for implementing the approved programme (Khadi & Village Industries Commission, 2015) (NPCS Board of Consultants & Engineers, 2015, pp. 2-3).

2.4.3: State Khadi and Village Industries Board and Apiculture

For the development of traditional and village industry one important initiative was undertaken by the Government of India which is Khadi and V.I. Commission which acts as a central organization. However, there was another organization called Khadi and V.I. Board which is a subsidiary to the Khadi and V.I. Commission and which operated at the state level. The state Khadi and V.I. Boards receive financial and technical assistance from Khadi & V.I. Commission for implementing development programmes in different states of India. Each

State Board has its own beekeeping extension staff for implementing and supervising the programme. The developmental programmes are implemented by the State Khadi and V.I. Boards directly or through Co-operatives and registered Institutions. In West Bengal, the West Bengal Khadi & Village Industries Board was set up by the state government under W.B.Act. XIV of 1959 and took over the activities from erstwhile Advisory Board on 1st. April, 1960 (West Bengal Khadi & Village Industries Board) (Khadi & Village Industries Commission, 2015) (NPCS Board of Consultants & Engineers, 2015, pp. 2-3).

2.4.4: Directly Aided Organizations of KVIC and Apiculture

The registered institutions or the Co-operative Societies, established prior to the establishment of the State Boards, were taken on the list of “directly aided institutions” by the KVIC. Financial as well as technical assistances are provided by the KVIC to these organizations for implementing the various approved programmes including apiculture development programme (NPCS Board of Consultants & Engineers, 2015, pp. 3-4).

2.4.5: All India Beekeepers’ Association (AIBKA)

The All India Beekeepers’ Association, as a directly aided institution of KVIC took up beekeeping development programmes in Uttar Pradesh. This Association has been publishing a Journal entitled “Indian Bee Journal” covering various aspects related to apiculture. Besides publication of journal other major activities of the Association are standardization of beekeeping equipment, supply of beekeeping books, charts and other audio-visual aids/literature (NPCS Board of Consultants & Engineers, 2015, pp. 3-4) (Suranarayana, 1994).

2.4.6: Apicultural Research Laboratory, Mahableshwar

The Bombay Village Industries Committee initiated beekeeping development programme in Mahableshwar way back in 1948 under the leadership of Shri S.G. Shende. Thereafter the Apicultural Research Laboratory was established in Mahableshwar in 1952 formally inaugurated by Shri Morarji Desai, the then Chief Minister of Bombay State. It was unique in the sense that it not only prioritized field-oriented research but also paid simultaneous attention to different disciplines of bee science like botany, management genetics and breeding, pathology and quality control of bee-products etc. The Apicultural Research Laboratory, Mahableshwar undertook various research projects of applied nature and published series of articles thus attracted the attention of KVIC, which recognized this

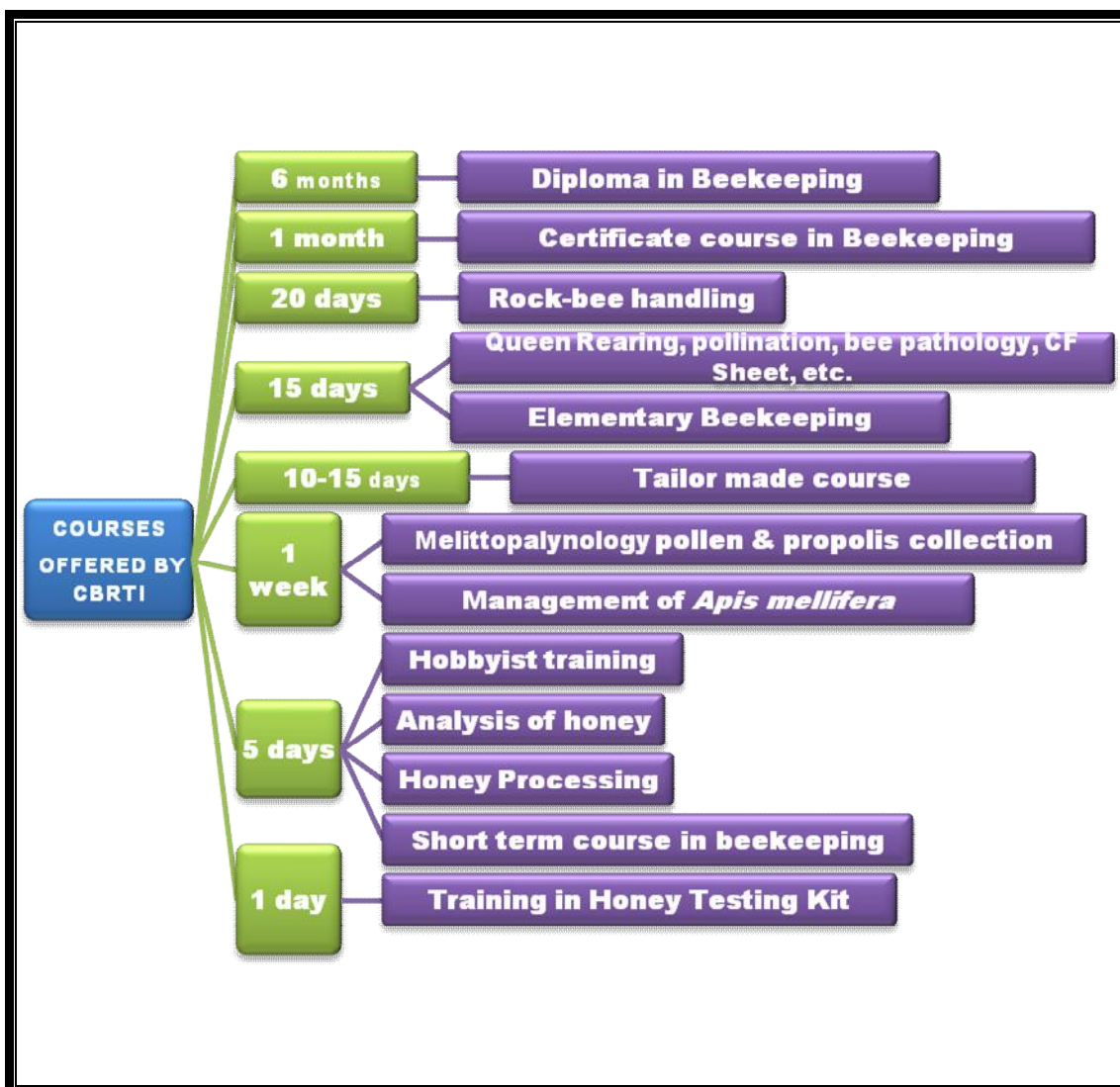
Laboratory as All India Training Centre for beekeeping and also provided financial assistance for the research programmes (NPCS Board of Consultants & Engineers, 2015, pp. 5-6) (Suranarayana, 1994) (Khadi & Village Industries Commission, 2015).

2.4.7: Central Bee Research and Training Institute under KVIC (CBRTI)

The work of the Apicultural Research Laboratory, however, was confined to limited area of Mahabaleshwar plateau and surrounding valleys in Western Ghats. Thus, a need was then felt to expand the scope of bee research activities to entire country. As a result, KVIC with the help of Maharashtra State Khadi and Village Industries Board established Central Bee Research and Training Institute (CBRTI) in Pune on 1st November 1962. The CBRTI in turn established Regional Bee Research Laboratories, Field observation Stations and experimental apiaries all over the country. It undertook field-oriented research programmes under its Departments of Botany, Melissopalynology, Bee-management, Bee-breeding, Bee-pollination, Bee pathology and Bee-Chemistry. It also prepared 10 to 15 drafts for scrutiny and adoption by Bureau of Indian Standards. Gradually, CBRTI received national recognition by organizations like Bureau of Indian Standards and AGMARK. Further, the University of Poona accepted it as a Centre for post graduate studies on bees and beekeeping. Similarly, International Bee Research Association, London, and the Canadian International Development Agency also recognised the CBRTI. In addition, the members of the National Commission on Agriculture (NCA) visited CBRTI and had series of meetings with the Scientists for bee research and development (Suranarayana, 1994) (Khadi & Village Industries Commission, 2015) (NPCS Board of Consultants & Engineers, 2015, pp. 5-6).

The NCA in its final report to the Government of India (1976) wrote a Chapter on Apiculture and made many recommendations for the development of beekeeping in India. The Institute is one of the premier centres for beekeeping training in the country and is recognized internationally as beekeeping training centre for development of beekeeping. It also conducted the following courses (Diagram 2.1) with modern teaching aids:

DIAGRAM 2.1: COURSES OFFERED BY CBRTI



Source: (Khadi & Village Industries Commission, 2009)

2.4.8: All India Co-ordinated Research Project on Honey Bee Research and Training (AICRP)

The National Commission on Agriculture (NCA) had included apiculture in its study and made valuable recommendations for improvement. Examining the working of the Central Bee Research and Training Institute of the KVIC and realizing its importance in the nation's apicultural development, the NCA suggested its strengthening and upgrading to the status of a national Institute. The NCA submitted its report to the Government in 1976, which was accepted by The Ministry of Agriculture and which was passed on to Indian Council of Agricultural Research for its implementation. In light of the recommendations of NCA and the needs of a vast country like ours with climatic, floristic and phenological heterogeneity, a much larger and co-ordinated programme was an obvious necessity.

Acting upon the recommendations, the Indian Council of Agricultural Research started an All India Co-ordinated Project on Honey Bee Research and Training (AICRP) in 1980, as a measure to strengthen the research and training activities of the CBRTI. At CBRTI, in July 1981, broad areas of research and training were identified for implementation at eight different co-operating centers under All India-Co-ordinated Research Project on Honeybee Research and Training with main co-ordinating centre located at CBRTI, Pune. The Headquarter of the Main Co-ordinating Centre remained at Pune for a couple of years. Subsequently it was shifted to Haryana Agricultural University, Hissar. Other Co-operating Centres were located at Ludhiana (Punjab), Vijayrai (AP), Jorhat (Assam), Pusa (Bihar), Vallyani (Kerala), Pantnagar (UP), Solan (HP), Bhubaneswar (Orissa). Similarly, one centre each at Indian Agricultural research Institute (New Delhi) and the Chithali station of Indian Institute of Horticultural Research (Karnataka) was established. The major aspects of research undertaken by the AICRP pertained to *Apis mellifera* management, bee diseases, identification of plant species useful to honey bees, preparation of floral calendars, and pollination of crops using bee colonies and effect of different insecticides on bee colonies (Suranarayana, 1994) (NPCS Board of Consultants & Engineers, 2015, p. 6).

2.4.9: Punjab Agricultural University and Apiculture

In 1940, The Imperial Council of Agricultural Research established a Central Beekeeping Research Station in Punjab. But soon after its establishment at Lyallpur, it went to Pakistan. After partition, Punjab Agricultural University, Ludhiana, continued bee-research activities and had experimental stations at Nagrota and Katrian. After the reorganization of Punjab in 1966, bee research activities under Punjab Agricultural University commenced but were restricted to Ludhiana on introduction and acclimatization of European honeybee, *Apis mellifera* honeybee (NPCS Board of Consultants & Engineers, 2015, pp. 6-7).

2.4.10: National Bee Board (NBB)

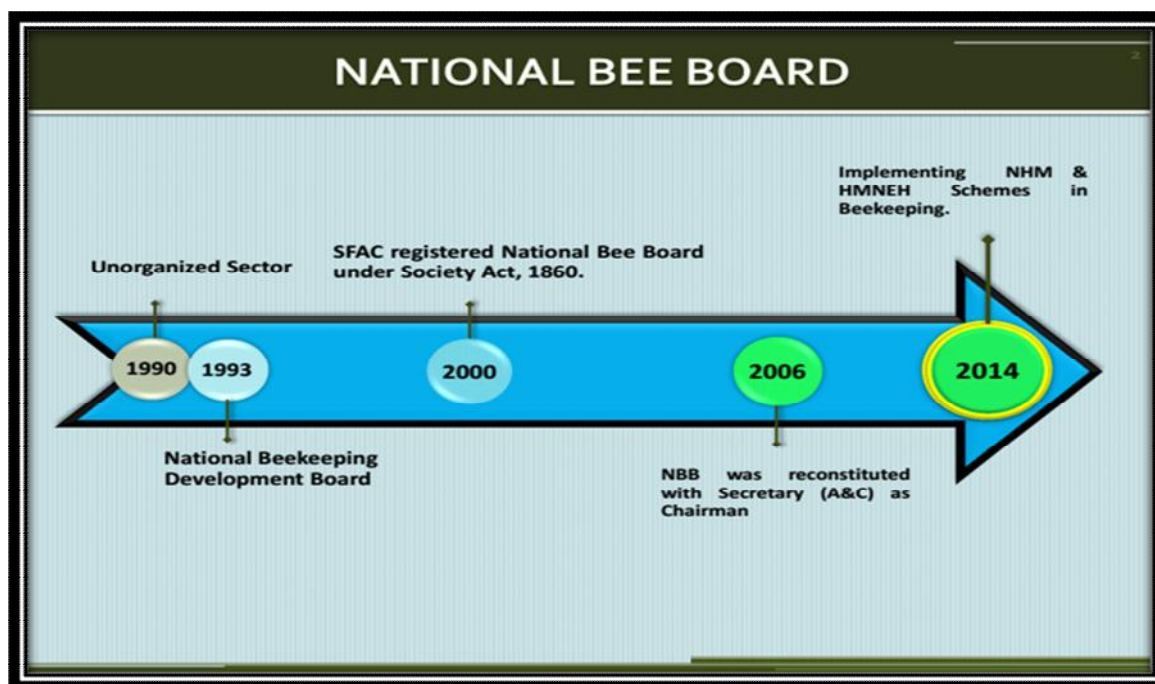
The Ministry of Agriculture, Govt. of India launched a Central Sector Scheme entitled 'Development of Beekeeping for Improving Crop Productivity' during the VIII plan (1994-95). The scheme had various components covering R&D, production & distribution of honey bee colonies, organizing trainings and awareness programmes and support for setting up honey processing plant, etc. A Beekeeping Development Board also functioned under the Chairpersonship of Secretary (A & C) to coordinate the Beekeeping activities. The Scheme was approved for continuation during the IX Plan. However, the scheme got subsumed under

the Macro Management Scheme, with effect from October, 2000. Nevertheless, the Department facilitated efforts by providing seed money through Small Farmers' Agri-Business Consortium (SFAC) for enabling the private sector to join hands in forming the National Bee Board as a Registered Society under Societies Registration Act, XXI of 1860 on 19th July, 2000. The institution was also supported and 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. In view of the tremendous scope for increasing productivity due to cross pollination and increase in income through Apiculture, it was proposed to revive Beekeeping activity in the country. This was to be done by pooling of the resources of the Department of Agriculture and enabling its cooperation with other organization, including the private sector. Accordingly, the National Bee Board (NBB) was reconstituted in June, 2006. 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 (National Bee Board, 2015).

The journey of National Bee Board are depicted in following diagram-

DIAGRAM 2.2: THE JOURNEY OF NATIONAL BEE BOARD



Source: (National Bee Board , 2014)

NBB Plan and its Objectives

The plans and objectives (National Bee Board , 2014) of the National Bee Board are laid down in its brochure. Following are the objectives of National Bee Board-

To Increase Productivity

- Through pollination of scientific beekeeping.
- Coordination & Management of good beekeeping practices for all apiary products.

To Increase Inclusivity

- No land ownership required.
- Support to marginal and small farmers including women.
- Negligible investment.

To Increase Sustainability

- Self multiplication of colonies.
- Entrepreneurship for unskilled labour.
- Formation of FPOs by involving industry, NGOs and Government.

To Increase Technology

- Transfer through trainings, seminars, and exposure visits.
- Guidelines from scientific community.

To Increase Quality

- Registration of beekeepers for traceability.
- Advisories for quality control parameters.
- Coordination with regulatory authorities for fixation of standards.

To Increase Marketability

- Vertical integration of beekeepers, traders and exporters.
- Horizontal level meetings with different regulatory bodies and exporters.

Activities of NBB

National Bee Board discloses its activities in its brochure (National Bee Board , 2014).

Following are the activities of National Bee Board which are given accordingly-

- Registration of beekeepers and farmers for traceability purpose.
- Integrating tribal and fringe communities of forest dwellers into beekeeping.
- Coordination for formulating standards for honey and other bee hive products in domestic and international markets.
- Ensuring hassle free transportation of bee colonies during migration.

- Advisories of good beekeeping practices.
- HRD: Training, seminar, exposure visits, etc
- Providing bee boxes, bee colonies, etc. to beekeepers.
- Publication of Magazine "Bee World".

2.5: DEVELOPMENT OF APICULTURE ACTIVITIES IN WEST BENGAL

With the important innovations in apiculture sciences, technologies and researches, the development of modern beekeeping in several countries got a new boost. In this movement India also joined hands. India took many attempts to introduce modern beekeeping in different provinces of India. However, the first state to introduce the modern beekeeping in India is Bengal in 1882. It is mentioned earlier that Mr. John Douglas, an employee of the Telegraph Department, Calcutta, kept the Indian bees in modern moveable frame hives in Calcutta and succeeded. After successful domestication of the local bees, he published a book entitled-"A Handbook on Beekeeping in India" in 1884. He described in his book that India had a great scope of apiculture. The book records his experience gathered from his Calcutta experiment contending that the Italian bees and the Indian bees could be kept in the English Standard hive following similar procedures. This according to him would ensure honey of excellent quality. Comparing the two bees, he admitted that the Italian bees were easier to domesticate and manipulate. To instil interest among the beekeepers to manufacture bee boxes and other appliances by using local resources, Mr. Douglas gave detailed descriptions of bee boxes and other implements in his book. Through his book he made a strong appeal to take up beekeeping in the country. He, however, recommended that the local bees should be kept in the country till the apiculture industry was well established and hoped that the Italian bees would be kept in future for large-scale beekeeping. Recently, the beekeepers of West Bengal too have started keeping Italian bees in their apiaries for a better output (Suranarayana, 1994)

After long gap, in the mid-1930s, modern beekeeping was introduced by Satish Chandra Dasgupta and Kshitish Chandra Dasguptas in Bengal. Inspired by the Swadeshi, Self-government and rural uplift movements of Mahatma Gandhi, Satish Chandra Dasgupta established an Ashram, Khadi Pratisthan, at Sodepur in 24-Paraganas, Bengal and took up several cottage industries that could be developed in villages; out of which, modern beekeeping was one. Kshitish Chandra Dasgupta established a fine apiary of Apis Cerena bees in the Sodepur Ashram in 1936. British Standard and even locally made smaller boxes

were used in that apiary. Thus, new methods of bee-keeping and honey production were promoted in the state which ensured adequate production of the honey on the one hand and on the other promoted sustainable development. Further, focus was made on training and providing various kinds of assistance to the beekeepers including the procurement of bee boxes and other appliances. A series of articles by Kshitish Chandra Dasgupta were published during 1939-1940 in the weekly “Rashtravani”, which was issued from the Sodepur Ashram. Later, Kshitish Chandra Dasgupta wrote the book, “The Romance of Scientific Beekeeping”, which was published by the Khadi Pratisthan in 1946 (Suranarayana, 1994).

In West Bengal, tradition of collecting honey from wild hives of Sundarban still continues. In this regard mention must be made of the Mouleys who are involved in the profession of bee hunting. Mouleys are forest dwellers in Sundarban who often risk their lives in pursuit of honey. In the quest of honey, which is uncertain the Mouleys are often injured and are even killed by Royal Bengal tigers, snakes or crocodiles. On top of it, they are harassed by forest guards, BSF jawans and members of forest protection committee. Consequently, the coming generations of the Mouleys are disinterested in the honey hunting profession.

It is imperative to mention that honey hunting lasts for merely three months while beekeeping lasts around nine months. Since the span of honey hunting is limited, there is a need to make the profession a stable means of livelihood. As such it is necessary to blend Mouley’s traditional practices with the modern beekeeping techniques. This, however, can be done by encouraging the Mouleys to practice the modern apiary by keeping standard bee boxes. Yet another problem persists as the modern beekeepers are still being harassed while migrating bee colonies from one place to another.

Though Sundarban honey is very good in quality, it is often contaminated by brood juices and bee parts which degrade its quality. The presence of bogus honey, which is made out of deodourised tea liquor and sugar, and which is being sold as Sundarban honey on the streets of Calcutta, compounds to the problem all the more. In this way this wild honey has lost its market since the honey is not considered as standard. The honey, therefore, is being sold at a much lower rate (Ghosh, 1994, pp. 6-7).

In accordance of the potentiality of honey production, states in India have been divided into three segments (Khadi & Village Industries Commission, 2009) for the establishment of State Beekeeping Extension Centres, they are-

(i) Most Potential States: Punjab, West Bengal, Bihar, Kerala, Karnataka, Uttar Pradesh, Tamil Nadu, and Uttaranchal because all these states have very high number of beekeepers and honey production is very high.

(ii) Medium Potential States: Andhra Pradesh, Assam, Himachal Pradesh, J & K, Maharashtra, Gujarat, Jharkhand, Madhya Pradesh, Meghalaya / Shillong and Orissa due to availability floral source but number of beekeepers and colonies are relatively less.

(iii) Less Potentials States: Manipur, Mizoram, Tripura, Rajasthan, Sikkim, Goa, Arunachal Pradesh and Andaman Nicobar.

As the above categorization of the KVIC suggests, West Bengal falls under “Most Potential States” head. In West Bengal, KVIC has implemented various apiculture developmental programme through different district level cooperatives. Out of these cooperatives, only 24 Paraganas District Beekeepers Cooperative Society Ltd. continued not only as a successful beekeeping organization but also as a model cooperative society in India. Later a number of organizations took up apiculture activities like- Ramakrishna Mission sponsored Narendrapur Apiary, Narendrapur, South 24 Paraganas; Sundarban Khadi & VI Association, Canning, South 24 Paraganas; HUMAN (Healthy Universe For Man And Nature), Nagarukhra, North 24 Paraganas; Sri Ramkrishna Ashram, Nimpith, South 24 Paraganas; West Bengal Beekeepers’ Association, Napara, Barasat, North 24 Paraganas; Abhoy Ashram Khadi & I. Activities, Birati, Kolkata and others. Dabur India (P) limited is also established their production unit in Narendrapur, South 24 Paraganas (Ghosh, 1994, pp. 11-12).

The Government of India had launched the Scheme of Fund for Regeneration of Traditional Industries (SFURTI). The Scheme envisaged need-based assistance for setting up of common facility centres, quality improvement, product development, replacement of production equipment, improved marketing, training and capacity building (Beekeeping Times, 2008). Following eight clusters were initially approved for Beekeeping development. The Central Bee Research & Training Institute (CBRTI), Pune has been approved as Technical Agency. Out of eight, one cluster was for West Bengal (Table 2.3). West Bengal Beekeepers' Association, North 24-Parganas was selected as an implementing agency.

TABLE 2.3: CLUSTERS WHICH WERE INITIALLY APPROVED FOR BEEKEEPING DEVELOPMENT UNDER THE SCHEME OF FUND FOR REGENERATION OF TRADITIONAL INDUSTRIES (SFURTI)

State	Location	Cluster Name and Location	Activity	Implementing Agency
Bihar	Muzaffarpur	Beekeeping Cluster	Beekeeping	Tirhut Dugdh utpadak Sahakari Sangh Ltd.
Jammu & Kashmir	Jammu	Jammu Beekeeping Cluster	Beekeeping	Khadi Gramodyog Sewa Sansthan, Jammu
Kerala	Kozhikode	Beekeeping & Honey Processing Cluster	Beekeeping, Honey Processing	Kozhikode Sarvodaya Sangh, Kozhikode
Maharashtra	Wardha	Amaravathi Beekeeping Cluster	Beekeeping	Pragathi Bahu-Uddeshiya Sanstha, Wardha
Tamil Nadu	Marthandam	Marthandam Beekeeping Cluster	Honey Processing	Marthandam Beekeepers' Cooperative Society, Marthandam (TNKVIB)
Uttaranchal	Chamoli	Beekeeping Cluster	Beekeeping	Dasoli Gram Swarajya Mandal, Gopeshwar, Chamoli
Uttar Pradesh	Saharanpur	Honey Processing Cluster	Beekeeping	Mahalakshmi Khadi Gramodyog Sansthan, Nakur, Saharanpur
West Bengal	North 24-Parganas	Beekeeping Cluster	Beekeeping	West Bengal Beekeepers' Association

Source: (Beekeeping Times, 2008)

The apiculture industry's developmental activities are carried on by the co-operative societies in West Bengal in order to develop the economic condition in the region. There are seven active beekeepers' cooperative societies in West Bengal. One of the main objectives of NBB is registration of beekeepers for traceability so that quality of this industry can be improved. NBB are always trying to increase the number of membership through registration of beekeepers and farmers for reaching to the beekeepers so that NBB can be able to provide hassle free transportation of bee colonies during migration, to give advisories of good beekeeping practices, to supply apparatus like bee boxes, bee colonies, to maintain standards for honey and other bee hive products in domestic and international markets and ultimately NBB can be able to develop human resource through training, seminar, exposure visits, etc. But it is noticed that there is no society of West Bengal who has got registration under NBB

(Table 2.11). However, it was found during the study that there are in fact seven beekeepers cooperative societies in West Bengal who are promoting beekeeping development. They are-

- 24 Parganas Beekeepers' Co-operative Society Ltd.
- Baruipur Apiculture Industrial Co-operative Society Ltd.
- Midnapore Beekeepers' Khadi & Village Industries Co-operative Society Ltd.
- Bishnupur Subdivision Beekeepers' Women Cooperative Society Ltd.
- Solo Mile Moudachhipalan Shilpa Samabaya Samity Ltd.
- Malda Bee-Keeping and Honey Processing Industrial Cluster Co-operative Society Ltd.
- Jalpaiguri District Bee Keepers Co-operatives Society Ltd.

Details of these apiculture cooperative societies are given with the help of following tables (Table 2.4 to 2.10) –

TABLE 2.4: DETAIL INFORMATION ABOUT 24 PARGANAS BEEKEEPERS' CO-OPERATIVE SOCIETY LTD.

Particulars	Information
Name	24 Parganas Beekeepers' Co-operative Society Ltd.
Registration No. and Date	508 of 1965, 24pgs, Dt. 30.04.1965
Address	Vill. – Shasan, P.O. & P.S. – Baruipur, District – 24 Parganas (South), Kolkata – 700144 West Bengal
Phone No.	033-24338187
Type of Society	Industrial
No. of Members	338
Board of Directors	Sri Ajoy Kumar Pal (Chairman) Sri Mrinmay Biswas (Vice Chairman) Sri Kanailal Tripathi (Secretary) Sri Umanath Bose (Director) Sri Chittaranjan Roy (Director) Sri Adhir Chandra Mondal (Director) Sri Pronav Kumar Raj (Director) Sri Gopesh Chandra Pal (Director) Sri Babla Majhi (Director)
Business Activities	Purchasing - raw honey from member-beekeepers Processing - raw honey Selling- bulk and small amount (loose or bottled) of honey Trading- other bee apparatus Training- modern beekeeping Publishing- books on beekeeping
Brand Name	“AMRIT” honey

Source: Office of the Assistant Director of Co-operative Audit, South 24 Parganas District & Office of the Registrar of Co-operative Societies, South 24 Parganas District

TABLE 2.5: DETAIL INFORMATION ABOUT BARUIPUR APICULTURE INDUSTRIAL CO-OPERATIVE SOCIETY LTD.

Particulars	Information
Name	Baruipur Apiculture Industrial Co-operative Society Ltd.
Registration No. and Date	16/C & SSI.WB/1999-2000 dt. 07.12.1999
Address	Khasmallick, P.O.- Dakshin Gobindapur, Baruipur, District – 24 Parganas (South), Kolkata -700145, West Bengal
Phone No	033-64500689, 033- 24371712 , 9432406525
Type of Society	Industrial Co-operative Society
No. of Members	17
Board of Directors	Shri Kanailal Ghosal (Chairman) Md. Masudur Rahaman (Vice Chairman) Smt. Jhuma Mukherjee (Secretary) Shri Prodhut Mondal (Director) Shri Prasanta Mondal (Director) Shri Baidyanath Mondal (Director)
Business Activities	Purchasing - raw honey from member-beekeepers Processing - raw honey Selling- bulk and small amount (loose or bottled) of honey Trading- other bee apparatus Training- modern beekeeping
Brand Name	“REGAL honey”

Source: Office of the Assistant Director of Co-operative Audit, South 24 Parganas District & Office of the Registrar of Co-operative Societies, South 24 Parganas District

**TABLE 2.6: DETAIL INFORMATION ABOUT MIDNAPORE BEEKEEPERS’
KHADI & VILLAGE INDUSTRIES CO-OPERATIVE SOCIETY LTD.**

Particulars	Information
Name	Midnapore Beekeepers’ Khadi & Village Industries Co-operative Society Ltd.
Registration No. and Date	02 Date 20.07.1965
Address	Vill. & Post. Pratappur, Dist.–Purba Medinipur West Bengal
Phone No	03228-254116
Type of Society	Primary Industrial Cooperative Society
No. of Members	161
Board of Directors	Sri Soumen Kumar Mahapatra (Chairman) Sri Tarapada Das (Vice Chairman) Sri Sadhan Chandra Pramanik (Panel Chairman) Sri Narayan Chandra Jana (Panel Chairman) Sri Damodar Jana (Panel Chairman) Sri Netai Chandra Kaw (Secretary) Sri Haripada Santra (Director) Sri Basudeb Gayen (Director) Sri Manik Chandra Manna (Director) Sri Lakahman Kumar Maity (Director) Sri Sachindranath Sahoo (Director) Sri Sanil Kumar Adak (Director)
Business Activities	Purchasing - raw honey from member-beekeepers Processing - raw honey Selling- bulk and small amount (loose or bottled) of honey Trading- other bee apparatus Training- modern beekeeping
Brand Name	“MODERN APIARY HONEY”

Source: Office of the Assistant Director of Co-operative Audit, Purba Medinipur District & Office of the Registrar of Co-operative Societies, Purba Medinipur District

**TABLE 2.7: DETAIL INFORMATION ABOUT BISHNUPUR SUBDIVISION
BEEKEEPERS' WOMEN COOPERATIVE SOCIETY LTD.**

Particulars	Information
Name	Bishnupur Subdivision Beekeepers' Women Cooperative Society Ltd.
Registration No. and Date	14BK Dated 02.06.1988
Address	Vill.- & Post. Joypur, Block – Joypur Dist. – Bankura. West Bengal
Phone No	03244-249639
Type of Society	Beekeeping
No. of Members	106
Board of Directors	Smt. Tarubala Biswas (Chairman) Smt. Arati Koley (Vice Chairman) Smt. Shila Barik (Secretary) Smt. Pratima Lohar (Director) Smt. Sabita Pandit (Director) Smt. Pari Paramanik (Director)
Business Activities	Purchasing - raw honey from beekeepers Processing - raw honey Selling- small amount (loose or bottled)of honey Training- modern beekeeping Providing- Lorry services for Migration to the beekeepers
Brand Name	“TBL MALLABHUM”

Source: Office of the Assistant Director of Co-operative Audit, Bankura District & Office of the Registrar of Co-operative Societies, Bankura District

TABLE 2.8: DETAIL INFORMATION ABOUT SOLO MILE MOUMACHHIPALAN SHILPA SAMABAYA SAMITY LTD.

Particulars	Information
Name	Solo Mile Moumachhipalan Shilpa Samabaya Samity Ltd.
Registration No. and Date	6/C&SSIWB of 1995-96 dt. 26.06.1995
Address	Vill. Solo Mile Post. Gurutola Block- Kaliyachak III Dist.-Malda West Bengal PIN- 732127
Phone No	03512-323441, 9733192832
Type of Society	Primary Industrial
No. of Members	19
Board of Directors	Sri Firoj Khan (Chairman) Sri Mainul Hoque (Secretary) Sri Miluruddin SK (Director) Sri Kamarujjamam (Director) Sri Sadhan Mondal(Director) Smt. Selima Khatun (Director)
Business Activities	Collecting - raw honey directly by members Processing - raw honey Selling- small amount (loose or bottled) of honey Training- modern beekeeping
Brand Name	“ Dew Drop Honey”

Source: Office of the Assistant Director of Co-operative Audit, Malda District & Office of the Registrar of Co-operative Societies, Malda District

TABLE 2.9: DETAIL INFORMATION ABOUT MALDA BEE-KEEPING AND HONEY PROCESSING INDUSTRIAL CLUSTER CO-OPERATIVE SOCIETY LTD.

Particulars	Information
Name	Malda Bee-Keeping and Honey Processing Industrial Cluster Co-operative Society Ltd.
Registration No. and Date	01/M&SSI, W.B. of 2010-11
Address	Vill.- Char Kaderpur P.O.- Sahapur Block- Old Malda Dist.-Malda (W.B.) PIN- 732142
Phone No	9932106025, 9733246591
Type of Society	Industrial Cooperative Society
No. of Members	700
Board of Directors	Sri Ratan Mandal (Chairman) Sri Subhash Mandal (Vice Chairman) Sri Asoke Mandal (Secretary) Sri Ranjit Sigha (Director) Sri Tapan Sigha (Director) Sri Bikash Sarkar (Director) Sri Bhaskar Mandal (Director) Sri Gouranga Sikdar (Director) Smt. Rina Mandal (Director) Sri Shyam Sundar Mandal (Director) Sri Pravat Kumar Das (Director)
Nature of Business	Purchasing - raw honey from member-beekeepers Processing - raw honey Selling- bulk amount of honey Training- modern beekeeping
Brand Name	“Gour Honey” (not in market but proposed)

Source: Office of the Assistant Director of Co-operative Audit, Malda District & Office of the Registrar of Co-operative Societies, Malda District

TABLE 2.10: DETAIL INFORMATION ABOUT JALPAIGURI DISTRICT BEE KEEPERS CO-OPERATIVES SOCIETY LTD.

Particulars	Information
Name	Jalpaiguri District Bee Keepers Co-operatives Society Ltd.
Registration No. and Date	No. 13 Dated 28.06.1963
Address	P.O.- Dhugguri Dist.-Jalpaiguri West Bengal
Type of Society	Beekeeping
No. of Members	230
Board of Directors	Sri Narattam Sutradhar (Chairman) Sri Bhanu Bhagat (Vice Chairman) Sri Subhas Sarkar (Secretary) Sri Krishna Chandra Roy (Director) Sri Haripada Roy (Director) Sri Subhas Sarkar (Director)
Nature of Business	Purchasing - raw honey from member-beekeepers Processing - raw honey Selling- small amount (loose or bottled)of honey Now inactive, generating income from interest on bank deposit
Brand Name	No

Source: Office of the Assistant Director of Co-operative Audit, Jalpaiguri District & Office of the Registrar of Co-operative Societies, Jalpaiguri District

TABLE 2.11: SHOWING STATE WISE DETAILS OF BEEKEEPERS REGISTERED WITH NBB UPTO MAY, 2015

STATE WISE DETAILS OF BEEKEEPERS REGISTERED WITH THE BOARD UP TO MAY, 2015.													
Sl.No.	Name of State	Individual Beekeepers		Beekeeping & Honey Societies		Companies		Firms		Self Help Group		Bee-keeper & Bee-colony in Nos.	
		Entities registered	Bee Colonies	Entities registered	Bee Colonies	Entities registered	Bee Colonies	Entities registered	Bee Colonies	Entities registered	Bee Colonies	Entities registered	Bee Colonies
1	A.P.	30	2060									30	2060
2	Assam	1	100									1	100
3	Bihar	572	98823									572	98823
4	Chhattisgarh			1	500							1	500
5	Delhi	6	3810	1	80	3	5550	1	500			11	9940
6	Goa	4	200									4	200
7	Gujarat	13	840			1	90					14	930
8	Haryana	564	95225	1	1700	2	1050	4	6900			571	104875
9	H.P.	131	19240	2	20							133	19260
10	J&K	83	7699									83	7699
11	Jharkhand	2	750									2	750
12	Kerala			1	85							1	85
13	M.P.	95	14427	1	500							96	14927
14	Maharashtra	29	2950	1	100	1	500			1	200	32	3750
15	Nagaland	232	4265									232	4265
16	Odisha	27	835									27	835
17	Punjab	797	153953			4	60000	8	3200			809	217153
18	Rajasthan	258	54141	3	250			7	6500			268	60891
19	Tamil Nadu	1	50									1	50
20	Uttarakhand	259	34637	2	2515			2	3000			263	40152
21	U.P.	1584	211065	18	3260	3	5600	7	7300	1	50	1613	227275
22	West Bengal	603	54700									603	54700
TOTAL		5291	759770	31	9010	14	72790	29	27400	2	250	5367	869220

Source: (National Bee Board, 2015)

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