

Apiculture

Apiculture Meaning

“Apiculture is the scientific method of rearing honeybees. “

The word ‘apiculture’ comes from the Latin word ‘apis’ meaning bee. So, apiculture or beekeeping is the care and management of honey bees for the production of honey and wax. In this method, bees are bred commercially in apiaries, an area where a lot of beehives can be placed. Usually, apiaries are set up in areas where there are sufficient bee pastures – such as areas that have flowering plants.

Honeybees:

Honeybees belong to the order [Hymenoptera](#) and to one of the *Apis* species. (For a complete discussion of honeybees, *see* the article [hymenopteran](#).) Honeybees are social insects noted for providing their nests with large amounts of honey. A [colony](#) of honeybees is a highly complex cluster of individuals that functions virtually as a single organism. It usually consists of the [queen bee](#), a fertilized female capable of laying a thousand or more eggs per day; from a few to 60,000 sexually undeveloped females, the [worker](#) bees; and from none to 1,000 male bees, or [drones](#). The female of most species of bees is equipped with a venomous sting.

Queen bee:

Back in the parent colony, the first queen to emerge after the mother queen departs with the swarm immediately attempts to destroy the others. If two or more emerge at the same time, they fight to the death. When the surviving virgin is about a week old, she soars off on her mating flight. To maintain genetic [diversity](#) within a colony, a queen frequently mates with more than one drone (called [polyandry](#)) while in the air. She may repeat the mating flights for two or three successive days, after which she begins egg laying. She rarely ever leaves the hive again except with a swarm. Normally, sufficient [sperm](#) are stored in her sperm pouch, or [spermatheca](#), to fertilize all the eggs she will lay for the rest of her life. The drones die in the act of mating.

The queen can live up to five years, although many beekeepers replace the queen every year or two. If she is accidentally killed or begins to falter in her egg-laying efficiency, the worker bees will rear a “supersedure” queen that will mate and begin egg laying without a swarm emerging. She ignores the mother queen, who soon disappears from the colony.

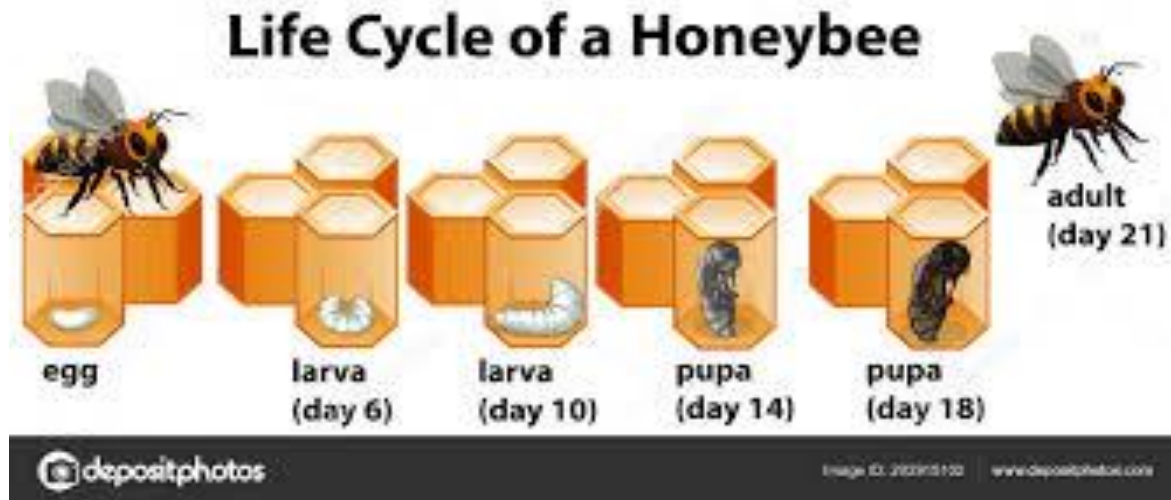
Worker bees:

Worker bees live about six weeks during the active season but may live for several months if they emerge as adults in the fall and spend the winter in the cluster. As the name implies, worker bees do all the work of the hive, except the egg laying.

Drones:

Drones are reared only when the colony is populous and there are plentiful sources of nectar and pollen. They usually live a few weeks, but they are driven from the hive to perish when fall or an extended period of adversity comes upon the colony. The only duty of the drone is to mate with the queen. The queen can lay drone (unfertilized) eggs in the drone cells. If she is not allowed to mate or if her supply of sperm is exhausted, she will lay unfertilized eggs in worker cells. The development of unfertilized eggs into adult drones is known as [parthenogenesis](#). Occasionally a colony may become queen less and unable to develop another queen. Then some of the worker bees begin to lay eggs, often several to a cell, and these develop into drones. A colony that has developed laying workers is difficult.

Life Cycle of honey Bee:



The scientific name of honey bees is ‘*Apis*’, which is Latin for ‘Bees’. Most of the European honey bees fall under *Apis Mellifera*; with ‘*Mellifera*’ being the Latin word for “honey-bearing”. The process of managing and breeding honey bees for acquiring honey and beeswax is known as [apiculture](#) or beekeeping. Apiculture is an old tradition that started with hunters in the forest in search of sweet honey.

Life Cycle of Honeybee:

The life cycle of honey bees is divided into four stages: the egg, the larval, the pupal and the adult stage.

Stage 1 – The Egg Stage:

Queen bee is the only bee in the colony who is capable of laying about 2,000 to 3,000 eggs in one day. The egg is positioned upright and falls on the side by the third day. The queen bee lays both fertilized egg and unfertilized egg. The fertilized egg develops into female bees or queen bees. The unfertilized egg hatches and male bees are born; also known as drone bees.

Stage 2 – The Larval Stage:

The difference between a worker and the queen bee is made three days after the egg transforms into larvae and six days after the egg is laid in the beehive. The “royal jelly” is fed to all the larvae, i.e., the female bees, the workers and the drone bees during their initial three days as larvae. The larva sheds skin multiple times

throughout this stage. Later, the royal jelly is fed only to the female larvae, which eventually becomes a queen bee. Finally, the worker bees cover the top of the cell with beeswax to protect and facilitate the transformation of the larvae into a pupa.

Stage 3 – The Pupal Stage:

Here the bee has developed parts like wings, eyes, legs and small body hair that physically appears close to an adult bee.

Stage 4 – The Adult Stage:

Once the pupa is matured, the new adult bee chews its way out of the closed-cell. The queen bee takes 16 days from the egg stage to form into an adult. The worker bee takes 18 to 22 days for complete development, and drone bees take 24 days to develop into an adult bee.

Importance of Beekeeping

The main advantages of beekeeping are:

1. Provides honey, which is the most valuable nutritional food.
2. Provides bee wax which is used in many industries, including cosmetics industries, polishing industries, pharmaceutical industries, etc.
3. Plays an excellent role in pollination. Honey bees are the best pollinating agents which help in increasing the yield of several crops.
4. According to the recent studies, the honey bee's venom contains a mixture of proteins which can potentially be used as a prophylactic to destroy HIV that causes [AIDS](#) in humans.

Common varieties of bees:

The beekeepers mostly take care of only those bee species whose names start with “Apis”- as they are the only species which produce honey. Common species of honey bees that are reared are as follows:

1. ***Apis dorsata***: It is also referred to as the rock bee. It is a giant bee and produces about 38 to 40 kg of honey per colony.

2. ***Apis indica***: It is also referred to as the Indian bee. It can be easily domesticated and is most commonly used for honey production. The annual yield of honey is 2 to 5 kg per colony.
3. ***Apis florea***: It is also referred to as the little bee. It rarely stings and thus honey extraction from its hive is easy. It produces about 1 kg of honey per colony per year.
4. ***Apis mellifera***: It is also referred to as the Italian bee. This species has a very typical dance routine to indicate food availability, and like the little bee, stings less. As the common name suggests, this species is not local. However, because of the high amount of honey produced, it is often reared by beekeepers.

Bee and their services:

HONEY – a sweetener rich in bioactive substances:

For millennia, honey was only considered a sweetener, whereas today we know that it contains many other substances that are beneficial for people. It is an excellent **nutrient** and **calmative**. Owing to its **antibacterial** and **antioxidant** properties, it is widely used in folk medicine.

POLLEN – A good source of proteins and vitamins:

Pollen is extremely rich in protein. It contains all the essential amino acids, various fatty acids, vitamins B, C, D, E and K, and provitamin A. Bees get covered in pollen as they collect nectar from plants, then they enrich it with different ferments, hormones and antibiotic substances, and deposit it in honeycomb cells. If we extract these balls of pollen out from inside a honeycomb cell, we get **extracted honeycomb pollen** or **bee bread**. If we install a pollen trap at the entrance to the hive, we get **trapped fresh pollen**. When bees try to squeeze through the wire of a pollen trap, pollen loads fall off their hind legs.

ROYAL JELLY – an excellent dietary supplement for the elderly:

Royal jelly is secreted by the glands of young worker bees. Nurse bees feed the jelly to the larvae, which are up to three days old, whereas queen bees live

exclusively on it. It is this distinctive food that decides whether a worker or a queen bee will hatch from the larva.

When the honeycomb cells contain the largest amounts of royal jelly, beekeepers harvest it. Production of extensive amounts of royal jelly is, however, very demanding.

PROPOLIS – Natural antibiotic

Propolis in particular is the beehive's very special treasure, because it is a **natural antibiotic**. Bees collect resin from a variety of trees and shrubs and blend it with pollen pellets while feeding larvae. Over 360 substances have already been found in it. We can use it in the form of alcohol- or water-based solutions or mix it with honey or other drinks (yoghurt, sour milk, tea etc.). We know of various pharmaceutical preparations made with propolis, such as ointments, tablets, injections and solutions that can be used topically.

WAX – For softer and younger looking skin:

Wax is produced by the glands of worker bees, which they need to build the honeycomb and to seal the top of honey-filled cells. Beeswax contains over 300 natural compounds, among which the main component is fatty-acid esters. Fresh wax is almost pure white, whereas later it turns a yellowish brown colour. It has a pleasant scent reminiscent of honey, propolis and pollen.

The cosmetics industry loves it:

Wax is often added to creams because it makes skin soft and supple and has antibiotic properties. The chewing of capping, i.e. the wax covering over honey, is well known, while thermal therapies using beeswax, which are usually carried taken straight after a massage or physiotherapy, are also becoming popular of late.

BEE VENOM:

Most people also know bees for their sting. Bees, however, need a very good reason to sting. If you encounter bees in nature, they will only sting if their life is seriously threatened. But in front of a beehive, a different story holds true. There,

guard bees diligently perform their duty of guarding the entrance to their home, which not only hosts larvae but also plentiful reserves of honey and pollen. We should therefore never come too close to apiaries or stand in front of hives. If we are stung by a bee it is completely normal to have some kind of reaction. In the case of an allergic reaction, however, we should seek medical assistance.

In medicine, bee venom is used to desensitize people allergic to bee venom. Around the world, bee venom is also used to heal various conditions and illnesses, but such treatment is only possible under medical supervision. Lately, bee venom is becoming increasingly popular in cosmetics industry. It is added to creams and serums, since it is supposed to be a natural substitute for Botox.

COMMERCIAL PRODUCTION OF HONEY

Commercial production of honey is done by two methods, namely indigenous method and modern method. To obtain pure and more amount of honey modern methods of apiculture are in practiced.

1. Old or indigenous method

This is primitive and unplanned method of apiculture. In this method two types of hives are used,

Natural fixed combs prepared by bees on the walls or the branches of trees

- I. Artificial or man-made movable hives. These hives are made from wooden logs or earthen pots etc.

In the indigenous method, the bees are first killed or made to escape from the hive with the help of smoke when the bees are at rest during night. This method has many drawbacks and it is not suitable for commercial large-scale production of honey. The following are the disadvantages of indigenous method:

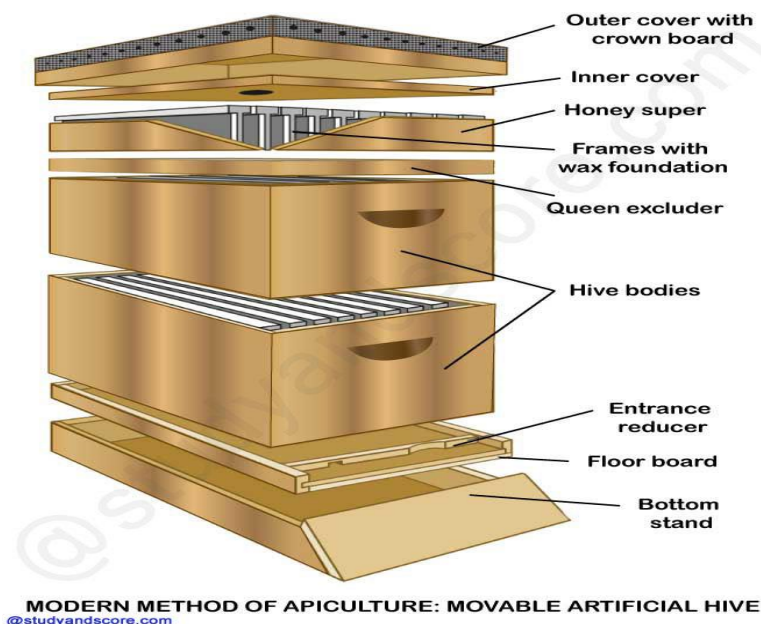
1. The honey cannot be extracted in the pure form. The extracted honey also contains the larvae, pupae and pollen cells.
2. The future yield of the honey is affected as the colony has to be destroyed to extract the honey. Moreover it takes lot of energy of the bees to build new hive.

3. The bees may not construct the new hive in the same place as the old one.
4. The natural hives also have the danger of attack by the enemies like rats, monkeys, ants etc. The natural hives can also be damaged by the climatic factors.
5. Also scientific intervention is difficult in the indigenous method and thus improving of the bee race is impossible.

Though the indigenous method has many drawbacks, it still persists.

2. Modern method

In the modern method of apiculture, the honey bees are reared in movable artificial hives. This was designed and invented by Langstroth in 1951. This invention has turned apiculture into a cottage industry and has provided employment to lakhs of people. The modern beehive is made up of a series of square boxes without tops or bottoms, set one above the other. These hives have a **floor board** and a **bottom stand** at the bottom and a **crown board** at the top. Inside these boxes, **frames** are vertically hung parallel to each other. The frames are filled with sheets of wax foundation on which the combs are built by the bees.



The entrance of the hive can be reduced with the help of the **entrance reducer**. The queen is usually confined to the brood chamber. The boxes termed **honey supers** are

used for storage of honey. The queen is prevented from going to honey supers by the **queen excluder** that allows only the workers to move.

The following are the steps included in apiculture or commercial production honey

Catching a swarm: Swarm is an old queen accompanied by huge population of workers flying to start a new hive. The swarm is generally collected with a straw basket called as skep with a lid.

Hiving a Swarm: It is the process in which the collected swarm is transferred to the hive to build up the colony and produce honey.

Initial feeding: After the hiving of the swarm, they are fed with sugar syrup. This feeding will help the bees to settle down to work in their new home.

Starting the work: After settling down in the new hive the bees start to work in their respective job roles in the new hive. The worker bees move about in the surrounding flora collecting nectar and pollen. Consequently, the colony expands and starts the production.

Advantages of using a Langstroth hive

- Most available resources of any hive style
- Hives are made to an industry standard, so hive components can be mixed and matched between suppliers
- Many accessories and upgrades are available
- 4-sided frame provides comb stability

Honey Manufacturing Process:

Full Honey combs removed from Hive:

To remove the honeycombs, the beekeeper dons a veiled helmet and protective gloves. There are several methods for removing the combs. The beekeeper may simply sweep the bees off the combs and guide them back into the hive.

Alternately, the beekeeper injects a puff of smoke into the hive. The bees, sensing the presence of fire, gorge themselves on honey in an attempt to take as much as they can with them before fleeing. Somewhat tranquilized by engorgement, the bees are less likely to sting when the hive is opened. A third method employs a separator board to close the honey chamber off from the brood chamber. When the bees in the honey chamber discover that they have been separated from their queen, they move through a hatch that allows them to enter the brood chamber, but not reenter the honey chamber. The separator board is inserted approximately two to three hours before the honeycomb is to be removed.

The majority of the cells in the comb should be capped. The beekeeper tests the comb by shaking it. If honey spurts out, the comb is reinserted into the honey chamber for several more days. Approximately one-third of the honey is left in the hive to feed the colony.

Uncapping the honeycombs:

Honeycombs that are at least two-thirds capped are placed into a transport box and taken to a room that is completely free of bees. Using a long-handled uncapping fork, the beekeeper scrapes the caps from both sides of the honeycomb onto a capping tray.

Extracting the honey from the combs:

The honeycombs are inserted into an extractor, a large drum that employs centrifugal force to draw out the honey. Because the full combs can weigh as much as 5 lb (2.27 kg), the extractor is started at a slow speed to prevent the combs from breaking. As the extractor spins, the honey is pulled out and up against the walls. It drips down to the cone-shaped bottom and out of the extractor through a spigot. Positioned under the spigot is a honey bucket topped by two sieves, one coarse and one fine, to hold back wax particles and other debris. The honey is poured into drums and taken to the commercial distributor.

Processing and bottling:

At the commercial distributor, the honey is poured into tanks and heated to 120°F (48.9°C) to melt out the crystals. Then it is held at that temperature for 24 hours. Any extraneous bee parts or pollen rise to the top and are skimmed off.

The majority of the honey is then flash-heated to 165°F (73.8°C), filtered through paper, then flash cooled back down to 120°F (48.9°C). This procedure is done very quickly, in approximately seven seconds.

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Although these heating procedures remove some of the honey's healthful properties, consumers prefer the lighter, bright-colored honey that results.

A small percentage, perhaps 5%, is left unfiltered. It is merely strained. The honey is darker and cloudier, but there is some market for this unprocessed honey.

The honey is then pumped into jars or cans for shipment to retail and industrial customers.

Quality Control:

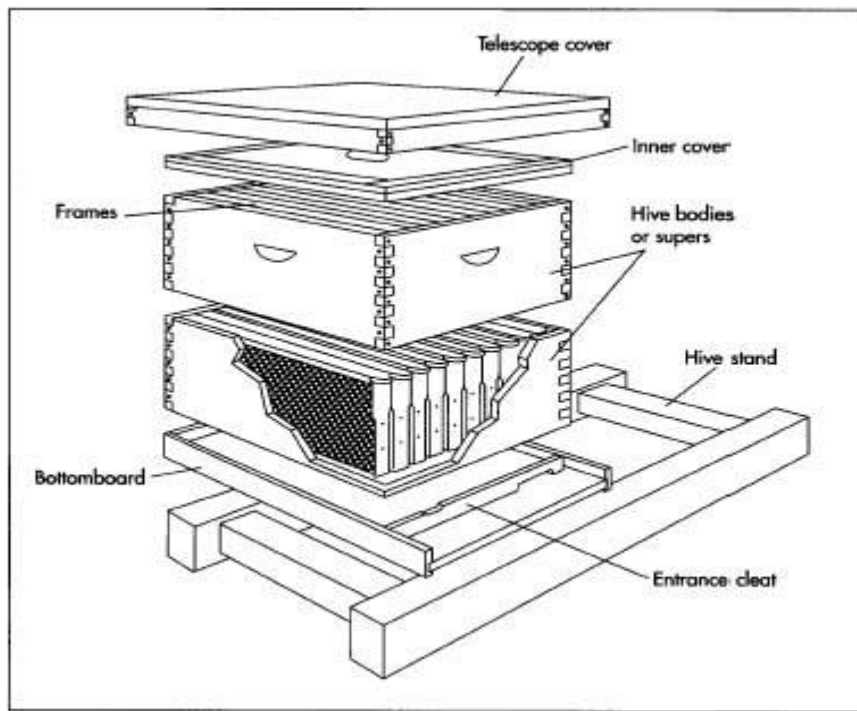
The maximum USDA moisture content requirement for honey is 18.6%. Some distributors will set their own requirements at a percent or lower. To accomplish this, they often blend the honey received from various beekeepers to produce honey that is consistent in moisture content, color, and flavor.

Beekeepers must provide proper maintenance for their hives throughout the year in order to assure the quality and quantity of honey. (pest prevention, health of the hive, etc.) They must also prevent overcrowding, which would lead to swarming and the development of new colonies. As a result, bees would spend more time hatching and caring for new workers than making honey.

Byproducts/Waste:

Four major byproducts of the honey-making process: beeswax, pollen, royal jelly, and propolis. Beeswax is produced in the bee's body as the nectar is transforming into honey. The bee expels the wax through glands in its abdomen. The colony uses the wax to cap the filled honeycomb cells. It is scrapped off the honeycomb by the beekeeper and can be sold to commercial manufacturers for use in the production of drugs, cosmetics, furniture polish, art materials, and candles.

Pollen sticks on the worker bee's legs as she collects flower nectar. Because pollen contains large amounts of vitamin B₁₂ and vitamin E, and has a higher percentage of protein than beef, it is considered highly nutritious and is used to the dietary supplement. To collect it, the beekeeper will force the bees through a pollen trap—an opening



A typical hive used in beekeeping.

screened with five-mesh hardware cloth or a 0.1875-in (0.476-cm) diameter perforated metal plate. The single- or double-screened opening allows the pollen to drop from the bees' legs as they fly through. The pollen drops into a container and is immediately dried and stored.

Royal jelly is a creamy liquid produced and secreted by the nurse bees to feed the queen. Nutrient rich with proteins, amino acids, fatty acids, sugars, vitamins, and minerals, it is valued as a skin product and as a dietary supplement. Proponents believe it prolongs youthfulness by improving the skin, increases energy, and helps to reduce anxiety, sleeplessness, and memory loss.

Propolis is plant resin collected by the bees from the buds of plants and then mixed with enzymes, wax and pollen. Bees use it as a disinfectant, to cover cracks in the hive, and to decrease the hive opening during the winter months. Commercially it is used as a disinfectant, to treat corns, receding gums, and upper respiratory disease, and to varnish violins.

National Bee Board (NBB)

The ministry of agriculture, now renamed as Ministry of Agriculture & Farmers Welfare, Government of India formed the National Bee Board in the year 2000 on July 19. The main aim of NBB is the complete development of Beekeeping by promoting Scientific Beekeeping in India to increase the productivity of crops through pollination and increase the honey production to increase the income of Beekeepers or honey farmers. The board also promotes beekeeping, honey, and other bee products industry in the country and regulate domestic and export market of honey and other allied products. The Board is authorized to establish or promote State Bee Boards in all major beekeeping States to coordinate the activities of the Board in respective States.

Meanwhile, the government of India has approved a new central sector program over the years 2018-19 and 2019-20 entitled "National Beekeeping & Honey Mission (NBHM)" for 2 years for the overall promotion and development of scientific beekeeping as a mission to achieve the goal of "Sweet Revolution" in the

nation by giving a boost to the capacity building and training, special focus on women, input support for the promotion and production, setting Integrated Beekeeping development Centers (IBDCs) other infrastructure, Digitization or online registration, processing of honey, value addition, market support, etc.

Loans and Subsidy for the beekeepers in India

- If anyone desires to begin beekeeping in India, govt. is ready to assist. The government has formed several boards for providing help and guidance to the Bee farmers but among all of the National Bee Board (NBB) is the prominent one. Many of the beekeepers have been benefited by the schemes and loans of NBB. National Bee Board also provides training to people who have an interest in Beekeeping Business.
- The Government is also providing 35% Subsidy to the Apiculture Business in India. The reserved category candidates will have to invest 5% from their own pockets. The government may offer Rs 10 lakh under the Prime Minister Employment Scheme, to start beekeeping as a full-time business for those individuals who don't fulfill the educational qualification.
- Among various banks, IDBI Bank is giving loan for Commercial Beekeeping in India. They named it as 'Bee Keeping Madhu Makshika' This Bank offers loans to farmers and non-farmers for too. Beekeeper has to utilize this loan amount just for setting up the units for honey
- production. Bee farmer can get the subsidy for this loan from the government bodies like DRDA, KVIC, and KVIB. The farmer needs to repay this loan within 5 to 7 years in quarterly or half-yearly installment according to his convenience. SHGs and NGOs can also apply for this loan. IDBI Bank is offering 11 months gestation period for this loan.
- Canara Bank is also offering loans for Beekeeping (Apiculture) according to the guidelines of the bank. You can approach the bank directly for the loan details.

- Punjab National Bank (PNB) also offers a loan for Beekeeping for trained Small and marginal farmers and agricultural laborers. Repayment of the loan is a maximum of 5 years including the gestation period.
- Punjab state co-operative agricultural developing bank also offers loans for beekeeping or apiculture. A person with beekeeping experience can get a

loan. If required Punjab agricultural university will provide the training. Insurance is compulsory. The loan should be repaid within 5 years. The individual can begin with at least 10 boxes. Loans are provided as per the guidelines set by the bank.