

BEE KEEPING AND ITS MANAGEMENT OF COCONUT, RUBBER, CASHEW, DITRUS, GINGELLY, FRUIT, TIMBER AND OTHER PLANTATIONS

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The honey bee (Sinhala: Mee-massa; Tamil: Thenkulavi) has benefited the people of Sri Lanka from pre-Vijayan times; whether one considers its contribution to the nourishment and health of the Veddah peoples already dwelling in the island or to the invaders from the Indian peninsula. While other kinds of related bees in Sri Lanka produce honey (the "danduwel-massa" about 1/2 lb. of honey, and the "bambara" sometimes 10 to 20 gallons per colony), attention is paid mainly to the honey bee owing to the quantity and quality of honey it produces *plus* the convenience in handling.

In early times, a colony of honey bees in the jungle was raided and the combs of honey gathered were chewed along with the grubs, royal jelly and other material they may have contained. This would have supplemented the honey with protein and other nutrients but was a wasteful practice in that the colony was usually destroyed and the finding of the next source of honey was mostly a matter of good luck. A later stage is the use of a clay pot into which a swarm of bees is transferred or to which they sometimes migrate on their own accord. The pot is often placed near the home in order to afford ready accessibility and some measure of protection against bears and against other human honey-gatherers. Combs from these pots or from wild colonies may be squeezed in order to collect the honey in bottles.

The presently widely used wooden hive or "bee-box" has moveable frames on which the bees build their combs of wax. The general design of this wooden beehive with moveable frames resembles that of hives used in Europe and North America but considerable modifications have been made to adapt it to the size and life habit of the honey bee found in Sri Lanka.

The benefit of the provision of moveable frames is that it permits easy handling and management of the colony as

well as efficient extraction of honey from a comb by centrifugation and the return of the comb to the hive for refilling.

Some Benefits of Bee Keeping

Bee keeping is an activity which is particularly suitable for Sri Lanka. While its products can provide food and (or) additional income to those who practise it, it is an environmentally non-polluting activity for which the raw material requirements and persons with at least the basic experience in handling bees are available in most regions of the country.

In other countries, the important role of bee keeping in pollination of fruit orchards and other economic crops is recognised. Indeed, bee keepers may supplement their income by renting out their bee colonies to farmers for the purpose of pollination during the flowering season. The undertaking may often be covered by a legal agreement incorporating safeguards for both parties concerned. In Sri Lanka, in view of the benefits of increased pollination for the agricultural production drive, the State should consider ensuring a reliable and preferably, subsidised supply of bee hives.

Bees' honey, royal jelly, pollen and the venom of bee stings are widely used, locally and abroad, for therapeutic or tonic purposes.

Among the other benefits which accrue from bee keeping and associated activities could be mentioned the income which could be earned by entrepreneurs who are able to set up a reliable supply of stocks of bees, bee hives and other accessories. The need for such a service in Sri Lanka today is evident from the numerous inquiries for these materials received by the Sri Lanka Bee Farmers' Association (SLBFA).

*This article is reproduced from the *Journal of the National Institute of Plantation Management* Vol. 2 No. 1, although it first appeared in 1982, the information contained in the article is still of significance to farming in Sri Lanka.

Some Basic Material Requirements for Bee Keeping (other than suitable plants)

1. *A Stock of Bees*

This may be obtained by capturing a swarm or by preparation from an existing colony by an experienced bee keeper. Purchase of a stock of bees can cost anything from Rs.15/ to Rs.100/- or more. It should be noted here that there can be marked differences in characteristics between colonies of honey bees, e.g. some strains of bees are better honey producers than others or more aggressive than others or more liable to swarm than others.

2. *A Hive*

This should be constructed to the standard specifications of the Department of Agriculture of Sri Lanka. When the author purchased his first hive (made of "Gini sapu" timber), it cost Rs.12/50 but it is difficult today to obtain such boxes for less than Rs.100/-. The Department of Agriculture (Apiculture Research Institute at Bindunuwewa, Bandarawela), has investigated the construction of hives using alternative materials in an effort to reduce costs. The hive should be placed at a convenient height on a stand or other support, with suitable protection against ants, termites and other pests.

3. *Entrance Guard*

This prevents the queen bee from leaving the hive while the new colony is not yet established. This is usually supplied when a wooden hive is purchased.

4. *Wax Foundation Sheets*

These sheets are not essential but are very useful as foundations on which the bees can build their combs. They should be locally produced.

5. *Bee Veil and Gloves*

Many bee keepers do not use a veil or gloves, but wearing them gives confidence to the beginner. Use of these till experience in bee keeping is gained will help the beginner to avoid being distracted from the task he is engaged on. Use of protective clothing can also mask the smell of sweat, which may have an irritant effect on bees. The

Government bee keeping officers may be consulted regarding designs and materials for these and other bee keeping accessories.

6. *Smoker*

A smoker is very useful to quieten the bees when a hive needs to be opened or a colony has to be transferred or otherwise manipulated. Models are available locally from Rs.40/- to Rs.125/- but inexpensive makeshift arrangements to deliver smoke are often to be seen.

7. *Centrifuge*

If only a few hives are concerned, it may be possible to borrow a centrifuge at the time of the honey harvest. A suitable centrifuge could, however, be constructed for around Rs.300/- Rs.400/-.

8. *Record Cards*

For recording the history and performance of colony.

9. Other (non-essential) accessories could include items such as "queen excluders". Some sugar syrup may also need to be fed to a colony occasionally for it to be able to tide over periods of dearth.

Honey

The feeding of sugar syrup to honey bees can result in some of it being stored in the combs. However, this should not, correctly speaking, be called "honey". Another non-floral variety is called "honeydew honey", which is made by honey bees which have collected, principally, the secretions of/or on living parts of plants and little nectar from flowers. An example of "honeydew honey" in Sri Lanka is "rubber honey", made by honey bees which have collected (non-floral) secretions from rubber trees. Due probably, to factors of humidity and evaporation, more honey is said to be obtained from rubber trees in wet areas such as Ratnapura than from those in the drier areas.

Floral, nectar or blossom honey is produced by the bee mainly from the nectar of flowers. Monoflora honey (unlike polyflora honey) comes mainly from one kind of plant; the principal type of honey, is often contributed by

its flavour, colour etc., and is investigated by examination of the pollen grains present in it (and which can be used to identify the different plant species).

Pollen

Honey bees collect pollen as well as nectar for the food requirements of the colony. The pollen provides a source of protein and many flowers are visited more for the pollen they provide than for the nectar. The coconut flower is an example of one which is more valuable as a pollen rather than a nectar source; with a further food source being evident from the number of bees which may be observed to visit coconut and other palms which are being tapped.

Bee Flora

Many plants of economic importance (or which are otherwise useful) are visited by the honey bee for pollen, nectar and (or) other secretions. Table 1 gives a selection of some of these plants. It is seen that many inter-cropped plants (e.g. coconut, coffee and pepper) provide bee forage (bee pasture) so that bees' honey could form a further harvest on the same land, if insecticide usage is not too liberal. The value of ornamental plants, such as the pink antigonon, and others which may not have an economic importance, such as nidikumba, as bee forage should also not be overlooked.

Floral Calendars

Most plants and trees are not in flower continuously throughout the year (the coconut is an exception) but have definite flowering seasons. Figure 1 gives the model of a "floral calendar" drawn up to depict the flowering times of various economic plant species in a hypothetical region. A complete "floral calendar" would, of course, include the time of flowering of the non-economic plant species (often of much importance) in the region. It should also be noted that the optimal foraging range of the local honey bee is up to 1/4 to 1/2 mile so this would constitute the foraging distance in any direction from a given hive, which is of considerable practical importance. It would be helpful, especially, in the present context of agricultural development, if floral calendars (preferably including acreages of plantations) could be drawn up for the different parts of the island and compiled into a (regularly revised) reference work.

Table 1

Some economic and (or) useful plants and trees visited by honey bees for nectar, pollen and (or) honeydew. (As a general rule, a honey bee on a trip for pollen or nectar only visits flowers of a single species).

Ambarella	Indian corn	Parsley
Avocado	Jambu	Passion fruit
Bamboo	Katurumurunga	Peanut
Bandakka	Kitul	Pear
Beli	Kumbuk	Pepper
Brinjal	Lime	Plantain
Broccoli	Mango	Pumpkin
Brussels sprouts	Mangosteen	Radish
Cabbage	Mara	Rambutan
Caraway	Mee	Rape
Carrot	Milla	Raspberry
Cashew	Mint	Rubber
Cauliflower	Mora	Safflower
Coconut	Mukunuwenna	Sorghum
Coffee	Mung	Soyabean
Coriander	Murunga	Strawberry
Cotton	Mustard	Sunflower
Cucumber	Na	Tamarind
Dill	Nadun	Tea
Eucalyptus	Nelli	Teak
Fennel	Onion	Thampala
Gingelly	Orange	Thippili
Goraka	Palmyrah	Tomato
Guava	Papaw	Veralu

Table 1 : Model "floral calendar" for a hypothetical region for economic plant and tree species

January	February	March	April	May	June
Coconut	Coconut	Coconut	Coconut	Coconut	Coconut
Mango	Mango		Gingelly	Gingelly	Murunga
	Rubber	Rubber		Coffee	
	Teak			Lime	

July	August	September	October	November	December
Coconut	Coconut	Coconut	Coconut	Coconut	Coconut
Murunga	Murunga	Lime	Lime	Maize	
		Orange	Orange	Cotton	
Teak			Coffee	Coffee	Coffee

Bee Keeping on Plantations

For bee keeping on plantations, a source of drinking water for the bees is necessary, but too much feeding of sugar syrup should be avoided in view of the expense involved. The density of colonies (number of colonies per acre) which can be maintained without supplementary feeding of sugar syrup, on a plantation depends on several factors, including the rainfall pattern (which can vary from year to year) and the monthly availability of nectar (or honey dew) and pollen. For example, during "honeyflow seasons" (as appropriate), two or more dozen colonies may possibly be accommodated per acre of eucalyptus or rubber plantations but not more than, say, 3 colonies per acre of coconut. The longstanding interdependence of effective bee farming and agriculture is exemplified by the description that in ancient Egypt bee hives were placed on barges which were moved along the Nile as each fruit orchard or other crop came into flower.

Migratory Bee Keeping

Useful benefits can be obtained from one or more colonies of bees kept on a single plantation throughout the year. In up country areas, about 6 lbs. of honey may be obtained on average per hive per years, although under certain circumstances much higher figures, such as 66 lbs. in one year (Dayaratne, 1968), have been recorded. However, in professional bee farming, enhanced yields of honey are regularly obtained by systematically transporting bee colonies (often hundreds or thousands at a time) throughout the year to each type of bee flora as the "honeyflow" commences. Thus, in the model given in Figure 1, the colonies would be taken from the rubber plantations in April, when the "rubber honeyflow" ceases, and transported to the gingelly area in time to catch this honeyflow.

Such professional type of migratory bee farming would

probably be necessary for the production of adequate quantities of honey for export purposes.

Markets for Honey and Wax

Bees' honey can be readily retailed in Colombo today at around Rs.30/- per lb. and is principally used in Sri Lanka as a food and in the preparation of Ayurvedic medicines. Bees' wax is used in furniture polishing, batik manufacture, etc., and can be sold at anything from Rs.40/- to Rs.120/- per kg. depending on quality etc., while "bambara" wax may fetch a lower price. It should be noted that it can be uneconomic for a bee keeper to sell wax from his hives as bees consume a large amount of honey during the production of wax; so that it is advantageous to extract the honey by centrifugation and to return the combs to the hive for refilling. The SLBFA advises its members on the marketing of their honey while several traders are found in Gabo's Lane and Bankshall Street in the Pettah who deal in bees' honey and wax. Prices can vary widely depending on season, type of honey, and other factors. Imported honey is also marketed, although at higher retail prices than the domestic product. In 1980, the import of 16,605 kg. of bees' honey cost Rs. 352,371/- and that of 1875 kg. of "bees' wax and other insect waxes cost Rs.255,057/- (Customs Returns).

Possibilities exist for developing export markets for Sri Lanka bees' honey. World demand is increasing due, among other factors, to the growing interest in natural and health foods in importing countries. A requirement is, however, that prospective exporter (or exporting group) be in a position to assure regular and fairly substantial quantities of good quality honey for shipment. In addition to analytical quality control for purity, etc., the honey should be permissible under the honey legislation of the country to which it is to be exported. Criteria laid down in the honey legislations can vary significantly from country to country. Further information on export possibilities and the world honey trade is given in publications by the International Trade Centre UNCTAD/GATT (1977).*

Quality Control

The majority of locally produced honey offered for sale in retail quantities has not been subjected to laboratory testing for quality. While the Sri Lanka Standards Insti-

tution has a specification for bees' honey, the large number of small producers who sell a few bottles of (unlabelled) product per year makes its observance difficult. The apparent willingness of some small traders to handle small "one-off" lots of bees' honey offered by unknown vendors further aggravates the problem. One available safeguard is to purchase bees' honey from a supplier in whom one has confidence and here again the SLBFA may be in a position to provide suggestions on request.

Some containers of local honey are seen to contain clean, dry grains of paddy and (or) black pepper corns. These are a traditional addition to enhance keeping qualities during storage.

While a honey may be classed as inferior due to one of a variety of criteria, it may be noted here that a honey may crystallize to give an opaque appearance and somewhat solid consistency without being in any way adulterated. While most consumers in Sri Lanka appear to prefer liquid, clear honeys, in many cases (especially overseas) the granulated varieties are sought after. A honey which has been crystallized can usually be readily clarified by slightly warming, e.g. by standing the container in warm water.

Honey destined for the export market usually has to undergo thorough laboratory testing (e.g. for moisture content, diastase activity, hydroxymethylfurfural content) in addition to examination for acceptability as to appearance, taste etc. A honey exporting country may ship several thousand tons per year and it has been emphasised that there should be consistency between the samples submitted and the qualitative characteristics of the bulk consignments.

The production of honey in other countries is from time to time significantly affected by the spread of diseases in bee colonies and the importation of stocks of bees etc., into Sri Lanka should be avoided to minimise the possibility of introduction of bee diseases and pests into the island.

Bee Diseases and Pests

A number of bee diseases are known (Morse, 1978) but usually the stocks of bees in Sri Lanka are quite healthy. A number of "visitors" such as ants, house lizards, spiders and mice may be found in hives (Gunawardena, 1975)

* Available at the, Sri Lanka Export Development Board, Ramada Renaissance Building, 115, Sir Chittampalam Gardinaer Mawatha, Colombo 2.

A number of "visitors" such as ants, house lizards, spiders and mice may be found in hives (Gunawardena, 1975) but the greatest problem is presented by wax moths. One method of reducing this problem is the regular weekly inspection of the hive, which should include cleaning off the debris found on the bottom board.

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Most of the publications listed are available in libraries in Colombo. Although some material may only be relevant to bee-keeping in temperate climates and some may be in part out of date, they still make interesting and stimulating reading.

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