EVALUATION STUDY ON RAPID ASSESSMENT OF MADHUVANA & APICULTURE SCHEME

External Evaluation
Report No. 1 of 2014



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Karnataka Evaluation Authority

STUDY CONDUCTED FOR
KARNATAKA EVALUATION AUTHORITY

AND

DEPARTMENT OF HORTICULTURE, GOVERNMENT OF KARNATAKA

BY

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Preface

Beekeeping/Apiculture refers to the keeping of honey bees in hives and collection of honey and allied products from them. Though collection of honey from hives of wild bees has a history dating to about 15000 years, the system of keeping honey bee colonies began in the 18th Century in Egypt.

Bee keeping has been gaining popularity over the years because of the financial and medicinal benefits of honey becoming more and more well known to all. It is a cottage industry requiring minimal investment in terms of capital and labour both. If the benefit of increased crop production due to pollination done by honey bees kept is added, apiculture becomes a still more desirable part time occupation.

In Karnataka, apiculture is an important activity that is popular in the areas of Western Ghats. Kodagu district is well known for branded honey produced from apiculture practiced in Coffee Estates. With the areas in Eastern Karnataka increasing their area under horticulture, apiculture has the potential to become a preferred occupation there too.

The Government of Karnataka, through its department of Horticulture, has been promoting apiculture under the Suvarna Bhoomi Yojane. It was felt necessary to have an evaluation done of how the scheme was doing in the State. The Karnataka Evaluation Authority (KEA) was given the task of its evaluation by the Planning, Programme Monitoring and Statistics Ministry. The study was outsourced to the Technical Consultancy Services Organization of Karnataka (TECSOK), Bangalore.

The study has shows some interesting results like-

1. The most preferred bee for apiculture, *Apis cerana*, has two variety; one red in color and another black.

2. Migrating bee keeping is very rare in the State, but has immense potential and needs to be promoted.
3. Apiculture is practiced more as a hobby than a serious business in most of the districts.
4. Honey produced by apiculture fetches better price in the market than the honey collected in the wild.

The study has received constant support and encouragement from the Principal Secretary, Planning, Programme Monitoring, and Statistics Department of the Government of Karnataka. The study could not have been possible without the continuous help and support of the officers of the Department of Horticulture of Karnataka. The study has had the benefit of being improved and improvised by the academic and contextual inputs of the members of the Technical Committee of KEA.

I hope that the evaluation study will provide insightful and relevant inputs to the Department of Horticulture in Karnataka, and that they will, taking clues from the findings and recommendations of the evaluation report, take suitable measures to improve the scheme still better, so that its desired objectives are achieved.

15th September 2014
Bangalore

Chief Evaluation Officer
Karnataka Evaluation Authority

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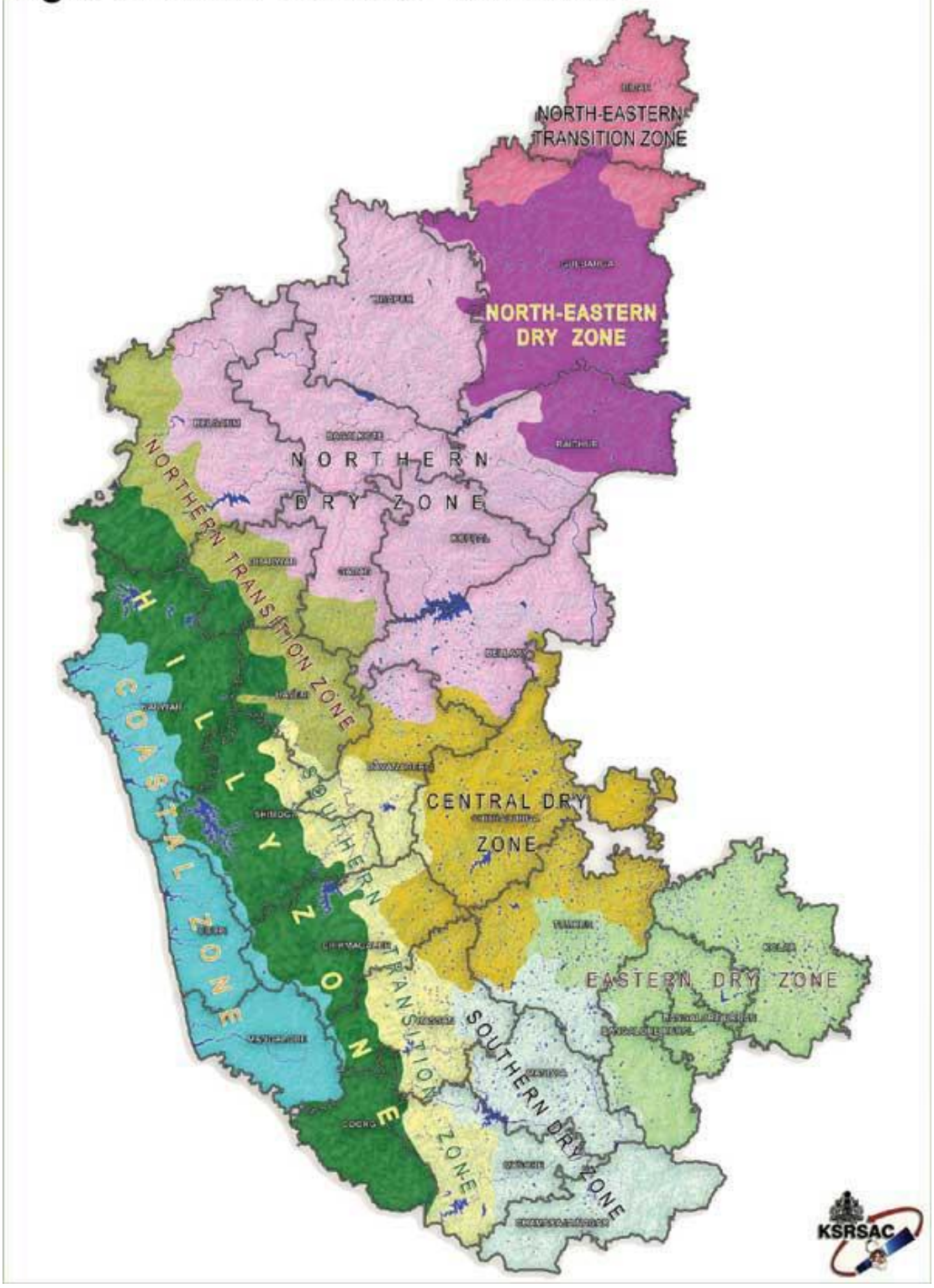
Agro Climatic Zones of Karnataka



Chapter – 1 : Introduction

1.0 Beekeeping / Apiculture is a Cottage Industry. Bees harvest nectar and pollen from flowering plants and provide honey which is valued as food and medicine for ages. Bees are efficient pollinators in both natural and agricultural ecosystems and help in increasing the farm yields. Hence the government thought it fit to have a separate scheme for promoting scientific Apiculture particularly with the species Apis cerana. Apiculture scheme was earlier with the Industries & Commerce Department and was implemented through the Khadi & Village Industries Board. It was shifted to Horticulture Department during the year 2011-12.

Beekeeping Activity is closely linked to agriculture & horticulture farming of various crops. The pollination service through insects is prominently carried out by bees of different varieties viz., Apis dorsata, Apis cerana, Apis mellifera, Apis florea, Apis trigona, etc. Among these species, Apis cerana colonies are easy to maintain in bee boxes by providing conducive atmosphere. The honey yield varies from species to species. Quantity of honey collection by A. trigona & A. florea is negligible. Apis dorsata is a wild bee and cannot be maintained in bee boxes. A. mellifera is good in collection of four times the average quantity of honey collected by Apis cerana. But, it is difficult to maintain in stationery beekeeping and in local conditions. So, Apis mellifera beekeeping has failed except, one or two success stories in Uttara Kannada & Dakshina Kannada districts. In order to popularise beekeeping, honey production and consumption the benefits need to be popularised among the farming community. In addition to this, the constraints need to overcome in order to successfully maintain bee colonies. The benefits of beekeeping are as follows:

- Bees help in cross pollination thus they increase the productivity of crops.
- Proper utilisation of natural resources.
- Unemployed youth can start this business with minimal funds

- Three lakh man days to maintain, 10,000 bee colonies.
- 73,000 man days to manufacture appliances / equipments.
- Net income from 100 bee colonies is around Rs.1.70 lakhs / annum.
- It helps in rural development and promotes small village industry.

The Geographical area of Karnataka has been divided in to 10 agro climatic zones depending upon the rainfall, water resources, soil conditions, atmospheric temperature, etc. These are termed as Zone – 1 to Zone – 10 starting from Bidar as Zone – 1 to Uttara Kannada & Dakshina Kannada as Zone – 10 as shown in Annexe – 1. These zones have different cropping pattern due to above said climatic conditions. The climate and cropping pattern have major influence on beekeeping activity in the State.

Beekeeping is prominently developed in hilly areas with forest due to availability of nectar throughout the year. The popular bee species in Karnataka is Apis cerana. It is suitable for rising in bee boxes for both stationery and migratory beekeeping, the honey yield will be lower than Apis mellifera bee species. In addition to this, Apis mellifera, an Italian species is also practiced in beekeeping for higher yield of honey without the threat of swarming. It is suitable for migratory beekeeping because of very high feed requirement compare to Apis cerana and should be available throughout the year including off flowering season. Another species – Apis dorsata is the wild bee, not suitable for beekeeping in boxes.

Beekeeping has immense role in pollination service, thereby enhances high yield & quality of agriculture & horticulture crops. It is prominently noticed in case of oil seeds and vegetables. It has major role in seed production in poly house. Honey and other by-products like bees wax, royal jelly, pollens, propalis, bee venon, etc., are of great economic importance. Bee is the friend but not foe to mankind.

In Karnataka, beekeeping is noticeably developed in Kodagu, Uttara Kannada, Dakshina Kannada, Shimoga, Chickmagalur, etc.

The Government of Karnataka has been encouraging beekeeping activity in the State as an income & employment generating activity to the farmers / unemployed rural youths in the unorganised sector through various schemes and programmes in addition to boost yield of Agriculture & Horticulture produce in the State.

The Department of Horticulture provided funding for Apiculture development under Suvarna Bhoomi Yojane to purchase of bee boxes and bee colonies in the first year of implementation, which is continued during 2012-13. A budget provision of Rs. 200 lakhs was given for the development of Madhuvana and Apiculture activities. Under this scheme, short duration orientation training on beekeeping techniques are imparted to farmers, youths & women. Bee boxes and bee colonies distributed at subsidised rates to the trainees at the end of the training to practice the activity commercially by applying the techniques studies during the training programme.

The schemes implemented during 2011-12 & 2012-13 have been assigned to TECSOK by Karnataka Evaluation Authority for Rapid Assessment of Apiculture Scheme in Karnataka implemented by the Department of Horticulture, Government of Karnataka.

TECSOK duly acknowledge KEA for assigning the Evaluation of Rapid Assessment of Apiculture Scheme in Karnataka and providing timely guidance in successful completion of the report. Further, we acknowledge cooperation extended by the line department – Department of Horticulture, Government of Karnataka, officials & beekeeping assistants during field visits and collection of requisite details required for the Evaluation Report.

Chapter – 2 : Objectives, Terms of Reference & Methodology

2.1 Key Objectives of Madhuvana & Apiculture Scheme

- To create awareness among farmers in Karnataka on the importance of beekeeping practice for honey production and increasing farm production through bee pollination.
- Establishment of bee nurseries and production of disease resistant bee colonies in Madhuvanas for supplying to the farmers on regular basis.
- To distribute bee boxes and colonies to the interested beekeepers.
- To popularise honey production and consumption through extension activities.
- To create additional self employment opportunities in the rural areas.

2.2 Terms of Reference

- To assess the effectiveness of Madhuvana and Apiculture scheme implemented by Horticulture Department.
- To provide a snapshot of the economic contribution of Apiculture to the participating households, particularly on the small and marginal farmers.
- To assess the scope for further expansion of Apiculture activities in the state of Karnataka, and
- To recommend ways and means to popularise the Madhuvana and Apiculture scheme on a state-wide scale.
- To provide floral cycle including botanical names of flowering plants related to beekeeping activity.
- To provide life cycle of Apis cerana and Apis mellifera.

2.3 Methodology

- Classification / Identification of Districts / Taluks based on Agro Climatic Zones in the State.
- Collected details of the physical & financial achievement from Horticulture Dept., during the reference period.
- Based on the physical & financial result, selected geographical location for collecting data across the State giving due weightage to well performed & under-performed regions.
- Collected the list of beneficiaries covered under the scheme & number of `Madhuvanas' established.
- There are 10 Agro Climatic Zones in the State. Selecting sample districts / taluks and beneficiaries in each of the Agro Climatic Zones for focus group discussions.
- Contacted and collected information about the usefulness of the scheme from beneficiary through focused group discussion & interaction.
- Discussed with other stakeholders including Departmental officers, honey traders, including exporters.
- Discussed with farmers regarding the potential benefits pertaining to increase in the crop yield due to pollination service.
- Use of research tools like observation sheet / interview schedule.
- Subjective & objective data collected is analyzed and report has been generated.

2.4 Work Plan

2.4.1 Templates survey instruments

For collecting the required data for Rapid Assessment of Apiculture scheme, following survey instruments have been used;

a) Observation sheet for the Focus Group Discussion (FGD) with the beneficiaries. The observation sheet sought following information.

   - Name & address of the beneficiary
   - Year of obtaining the assistance
   - Type of assistance (a) Training (b) Supply of bee boxes with bee colony (c) a & b
   - Social category
   - No. of boxes supplied / held
   - Quantity of production of honey and other products

- No. of persons engaged in beekeeping activity
- Average annual income from beekeeping
- Marketing of the bee products
- Mode of honey extraction and processing
- Floral mapping based on flowering season
- Problem faced if any
- Suggestions for improvement in the scheme for encouraging beekeeping activity.

b) Interview schedule to collect following details from other stake holders viz., farmers, implementing agencies including madhuvana incharge, bee processors, etc.

- Awareness about the beekeeping and their opinion.
- Impact of beekeeping activity in the area and the improvement in the crop productivity.
- Problems faced by the implementing agency and suggestion for implementing the scheme.
- Adequate availability of honey for processing purpose and source of supply (locally, from outside, within the state or outside the state), mode of processing, suggestion for expansion of beekeeping activity, no. of persons employed, etc.
- Functions & problems of Madhuvana.

The data / information collected have been incorporated in relevant Chapters.

2.4.2 Sampling Design & Research Methodology

As per the data made available from the department, 4,550 beneficiaries are covered under Suvarna Bhoomi Yojane during the year 2011-12 and 6,075 beneficiaries have been trained and given 5,100 bee boxes with bee colony during the year 2012-13.

During the field visits, 605 beneficiaries who have been trained and supplied with bee boxes with bee colony from 10 Agro Climatic Zones, have been covered. Due representation has been given to cover farmers, youths & women and weaker section of society.

In addition, 50 stakeholders including farmers, madhuvana incharge, implementing agencies, honey processors across 10 agro climatic zones have been covered during the field visit.

Potential locations for field visit have been finalised representing 10 agro climatic zones across the state in consultation with the nodal officer / district officers of the department of horticulture.

Team of officers from TECSOK have visited the selected location to collect first hand information through FGD and discussion with stakeholders.

The subjective and objective data collected have been analysed by using suitable statistical technique and the outcome of the analysis have been suitably incorporated in the report.

Details of field visits representing zone-wise, district-wise, name of villages, sample size covered is given in Annexe - 2.

Chapter - 3 : Scheme Details & Achievement

3.1 Scheme Details

The Apiculture activity in the State has been navigated by formulating the scheme. The Department of Horticulture has engaged actively in development of Apiculture activity across the State. It has formulated the scheme for the year 2011-12 in the name of Suvarna Bhoomi Yojane - ¯ÉPÀÌ ²Ã¶ðPÉ Apiculture 2851-00-200-0-01. Later, in 2012-13 the previous scheme has been revised and formulated a new scheme – Madhuvana & Beekeeping Development Plan (State Sector S-21) – ¯ÉPÀÌ ²Ã¶ðPÉ: 2851-00-200-0-01 (AiÉÆÃd£É). These Schemes have been operated by Horticulture Department for Apiculture development. The salient features of these two schemes are provided below:

3.1.1 Suvarna Bhoomi Yojane

- ❖ The Government of Karnataka has earmarked the grant of Rs.625 lakhs for the scheme.
- ❖ Each beneficiary will be provided Rs.10,000/- incentive to cover 6,125 beneficiaries.
- ❖ The beneficiary should have at least four new bee boxes and engage in Apiculture.
- ❖ The scheme aims for expansion of high yielding and new varieties with improved technology for 2.50 lakh farmers and five lakh acres of land in order to enhance income.
- ❖ Involvement of private associations & institutions with Horticulture Department, University of Agricultural Sciences, National Horticulture Mission, National Bee Board, Honey Cooperative Society, Karnataka State Khadi & Village Industries Board, Bangalore University, ICRISAT, etc., by encouraging farmers for development of Apiculture.

3.1.2 Madhuvana & Beekeeping Development Plan

This plan has following sub-components.

Main objectives of Apiculture Development Scheme

- Providing 3 days training to the identified beneficiaries from district / taluk under entire Horticulture Development Scheme.
- Providing 3 days training to Contract Employees appointed for Apiculture Development.
- Organising training for officers & technical staff of Apiculture Division regarding new developments in Apiculture.

- Organising 3 months Certificate Training Course at Bhagamandala Apiculture Training Centre, Madikeri.
- Setting up of 10 Bee Propagation and 10 Honey Production Centres in Department Madhuvanas.
- Organising Madhu Mahothsava at District & State level.
- Intensive publicity for Apiculture through hand bills, video & audios.

Incentives

- Selected beneficiaries are provided free training by Horticulture Department for 3 days.
- Trained beneficiaries will be provided bee box at 50% of its cost with bee colony not exceeding Rs.1,500/- for each.
- Each trainee at Bhagamandala Apiculture Training Centre is provided stipend of Rs.750/- per month for 3 months with free lodging facility during training period.

The latest scheme is operated by both State & District schemes for development of Apiculture in the State.

3.2 Scheme Achievements

Suvarna Bhoomi Yojana: The scheme was implemented for the year 2011-12 with the target to cover 6,125 beneficiaries. The details are provided in the table below:

District-wise Apiculture Activities in Suvarna Bhoomi Yojane - Physical Target & Achievement for the year 2011-12

Sl. No.	Name of District	No.of Taluks	Target Beneficiaries (Nos.)	Achievement (Nos.)	Dist.-wise % age Allocation of beneficiaries	Dist.-wise % age Achievement
1	Bangalore Urban	4	160	119	2.61	74
2	Bangalore Rural	4	160	360	2.61	225
3	Kolar	5	200	49	3.27	25
4	Tumkur	10	300	493	4.90	164
5	Chitradurga	6	140	19	2.29	14
6	Shimoga	7	280	498	4.57	178
7	Mysore	7	200	42	3.27	21
8	Mandya	7	225	276	3.67	123
9	Kodagu	3	425	88	6.94	21
10	Hassan	8	250	160	4.08	64
11	Dakshina Kannada	5	800	468	13.06	59
12	Chickmagalur	7	280	124	4.57	44
13	Belgaum	10	350	276	5.71	79

14	Bijapur	5	50	28	0.82	56
15	Dharwad	5	150	93	2.45	62
16	Uttara Kannada	11	400	382	6.53	96
17	Gulbarga	7	50	28	0.82	56
18	Raichur	5	50	20	0.82	40
19	Bidar	5	50	34	0.82	68
20	Bellary	7	75	42	1.22	56
21	Davanagere	6	150	6	2.45	4
22	Chamarajanagar	4	200	103	3.27	52
23	Bagalkot	6	75	32	1.22	43
24	Gadag	5	50	5	0.82	10
25	Haveri	7	100	105	1.63	105

District-wise Apiculture Activities in Suvarna Bhoomi Yojane - Physical Target & Achievement for the year 2011-12 contd.

Sl. No.	Name of District	No.of Taluks	Target Beneficiaries (Nos.)	Achievement (Nos.)	Dist.-wise % age Allocation of beneficiaries	Dist.-wise % age Achievement
26	Koppal	4	75	94	1.22	125
27	Udupi	3	450	300	7.35	67
28	Chikkaballapur	6	200	285	3.27	143
29	Ramanagara	4	180	20	2.94	11
30	Yadgir	3	50	1	0.82	2
	Total	**176**	**6125**	**4550**	**100.00**	**74**

Source: Department of Horticulture, Government of Karnataka, Bangalore.

The Department has achieved coverage of 4,550 beneficiaries out of 6,125 which is 74%.

Madhuvana & Beekeeping Development Scheme (S-21): The scheme has been implemented for the year 2012-13 target to cover 3,750 beneficiaries and provide 3,750 bee boxes with bee colony to the beneficiaries. The target has been achieved 100% by the Department. The budget provided for the scheme during the reference period is Rs.150 lakhs. Out of Rs.150 lakhs budget, Rs.147.90 lakhs has been utilised, which is 99.93%. The details of the beneficiaries coverage is provided in the table below:

Achievement of Madhuvana & Beekeeping Development Scheme

Sl. No.	Name of District	Target & Achievement of Beneficiaries (Nos.)	Dist.-wise Allocation of beneficiaries % age
1	Bangalore U	100	2.67
2	Bangalore R	100	2.67
3	Kolar	100	2.67
4	Tumkur	150	4.00
5	Chitradurga	150	4.00
6	Shimoga	150	4.00
7	Mysore	150	4.00

Achievement of Madhuvana & Beekeeping Development Scheme contd.

Sl. No.	Name of District	Target & Achievement of Beneficiaries (Nos.)	Dist.-wise Allocation of beneficiaries % age
8	Mandya	150	4.00
9	Kodagu	100	2.67
10	Hassan	150	4.00
11	Dakshina Kannada	150	4.00
12	Chickmagalur	150	4.00
13	Belgaum	150	4.00
14	Bijapur	100	2.67
15	Dharwad	100	2.67
16	Uttara Kannada	150	4.00
17	Gulbarga	100	2.67
18	Raichur	100	2.67
19	Bidar	100	2.67
20	Bellary	150	4.00
21	Davanagere	100	2.67
22	Chamarajanagar	150	4.00
23	Bagalkot	150	4.00
24	Gadag	150	4.00
25	Haveri	150	4.00
26	Koppal	100	2.67
27	Udupi	100	2.67
28	Chikkaballapur	100	2.67
29	Ramanagara	100	2.67
30	Yadgir	100	2.67
	Total	**3750**	**100.00**

Source: Department of Horticulture, Government of Karnataka, Bangalore

It is observed from the above table that the fund assistance has been extended to all the 30 districts of Karnataka for promoting beekeeping activity across the State. Maximum beneficiaries covered per district are 150 and minimum is 100.

District Sector Scheme

The promotion of beekeeping activity has also been carried out under District Sector Scheme for only selected 17 districts during the year 2012-13. The scheme is similar to Madhuvana Development & Beekeeping Scheme aiming to train beneficiaries and provide bee box with bee colony for future beekeeping activity. District-wise training of beneficiaries and bee colonies details are given in the table below:

District Bee Keeping Development Yojane - 2012-13

Sl. No.	Districts	Training	Bee Boxes with Colony	%age of trainees received bee box with colony
1	Bangalore (R)	120	80	67
2	Bangalore (U)	120	97	81
3	Belgaum	30	30	100
4	Chickmagalur	180	150	83
5	Dharwad	60	30	50
6	Hassan	120	120	100
7	Kodagu	420	420	100
8	Mandya	60	40	67
9	Ramanagara	120	40	33
10	Shimoga	210	40	19
11	Tumkur	90	120	133
12	Udupi	90	93	103
13	Uttara Kannada	90	90	100
14	Chamarajanagar	150	-	-
15	Chikkaballapur	240	-	-
16	Dakshina Kannada	75	-	-
17	Mysore	150	-	-
	Total	**1,710**	**1,350**	**79**

Source: Department of Horticulture, Government of Karnataka, Bangalore.

From the above table, it is observed that 57% (17 districts) of districts in the State has been covered in this scheme based on the necessity. Out of 17 districts, beneficiaries from 13 districts are provided training & bee colonies, whereas four districts viz., Chamarajanagar, Chikkaballapur, Dakshina Kannada & Mysore have been provided only training. The bee boxes with colony are not given during the reference period due to lack of interest from the trained beneficiaries.

The percentage of trained beneficiaries taken bee boxes with colony is 100% or more in Belgaum, Hassan, Kodagu, Tumkur, Udupi & Uttara Kannada. The beneficiaries from remaining 11 districts have collected bee boxes with colony less than 100%. The least number of beneficiaries covered is 19% in Shimoga, whereas the State average is 79%.

Chapter – 4 : Bee Life Cycle

4.0 Beekeeping activity involves honey bee of different species for collection of honey, other bye-products and mainly pollination services for improvement of quality and increase in crop yield of agriculture & horticulture produce. In India and in Karnataka mainly two bee species are practiced beekeeping activity in boxes. They are Apis cerana (indigenous species) and Apis mellifera (imported / European bee species adopted in Indian conditions). Apis cerana bee colonies are raised by majority of the beekeepers in the State. In selected few coastal areas in Karnataka have Apis mellifera beekeeping activity. The bee life of Apis cerana and Apis mellifera are similar in many areas, so common details of bee life cycle and other details pertaining to beekeeping are provided below. Wherever, there is difference between these two species will be mentioned suitably to provide information in this regard.

4.1 Scientific Names

Scientific classification - Kingdom: Animalia, Phylum: Arthropoda, Class: Insecta, Order: Hymenoptera, Family : Apidae, Sub family: Apinae, Tribe: Apini Latreille, 1802, Genus : Apis Linnaeus, 1758, Common name: European honey bee, Scientific name: Apis mellifera Linnaeus and sub-species (Insecta: Hymenoptera: Apidae) and Apis cerana.

4.2 Biology & Life Cycle

Honey bee have highly social life history and a colony can be considered super organisms. It means the entire colony is viewed as a biological unit rather than individual bee. So, they produce not only bees but also produce more colonies.

In the bee colony, labour is divided among individuals. A bee colony will have mainly three types of bees viz., queen bee, drons & female worker bees.

Drones: Males or drones are typically haploid, having only one set of chromosomes. They are produced by the queen, if she chooses not to fertilize an egg; or by an unfertilized laying worker. Diploid drones may be produced, if an egg is fertilized but is homozygous for the sex-determination allele. Drones take 24 days to develop and may be produced from summer through autumn. Drones have large eyes used to locate queens during mating flights. Drones do not have a sting.

Workers: Workers are female and have two sets of chromosomes. They are produced from an egg that the queen has selectively fertilized from stored sperm. Workers typically develop in 21 days. A typical colony may contain 20,000 to 25,000 worker bees. Workers exhibit a wider range of behaviors than either queen or drone bees. Their

duties change upon the age of the bee in the following order (beginning with cleaning out their own cell after eating through their capped brood cell): feed brood, receive nectar, clean hive, guard duty, and foraging. Some workers engage in other specialized behaviors, such as "undertaking" (removing corpses of their nest mates from inside the hive).

Workers have morphological specializations, including the corbiculum or pollen basket, abdominal glands that produce beeswax, brood-feeding glands, and barbs on the sting. Under certain conditions (for example, if the colony becomes queenless), a worker may develop ovaries.

Queens: Queen honey bees, like workers, are female. They are created at the decision of the worker bees by feeding a larva only royal jelly throughout its development, rather than switching from royal jelly to pollen once the larva grows past a certain size. Queens are produced in oversized cells and develop in only 16 days. Queens have a different morphology and behaviour from worker bees. In addition to the greater size of the queen, she has a functional set of ovaries and a spermatheca, which stores and maintains sperm after she has mated. The sting of queens is not barbed like a worker's sting, and queens lack the glands that produce beeswax. Once mated, queens may lay up to 2,000 eggs per day. They produce a variety of pheromones that regulate behaviour of workers, and helps swarms track the queen's location during the migratory phase.

All honey bees undergo complete metamorphosis. This means that they have distinct developmental stages (egg, larvae, pupa, and adult). Typical developmental time from egg to adult varies by caste. Drones have the longest development (24 days), workers are intermediate (21 days) and queens are the fastest (15-16 days).

Eggs: Honey bee eggs look like a tiny grain of rice. The queen lays eggs in individual hexagonal wax cells in the brood area of the comb. After 3 days, eggs hatch and larvae emerge. Honey bee eggs can be difficult to see, but their presence indicates a laying queen is present in the colony.

Larvae: They are referred to as “open brood” because the cells are uncapped. The number of days a honey bee spends as larvae varies by caste. When the mature larvae are ready to molt into pupae they extend their bodies into an upright position in the cell and adult workers tending to the brood cover the pre-pupal larvae with a wax capping.

Pupae: Beneath the wax capping, pre-pupal honey bee larvae molt into pupae. The pupae remain under the wax capping until they molt into an adult and chew their way out of the cell. Similar to the larval stage, pupal developmental time varies by caste.

Adults: Adult honey bees can be divided into three body regions: head, thorax and abdomen. The primary features of the head are the compound eyes and antennae. Two pairs of wings and three pairs of legs that are attach to the thorax and a slender waist. The most notable external feature of the abdomen is the stinger. Only female honey bees have a stinger.

Functions: Queen bee for laying eggs to increase the population of the unit. Drons are male bees for mating with queen bee of other unit. Worker bees are females to collect nectar, convert in to honey, store in the hive, raise the colony and protect the colony.

Sting is a defensive tool of worker bees use to protect the colony. When a colony intruder is detected guard bees release an alarm through chemical (pheromone) to activate defence to protect the colony.

Apis cerana is a smaller size bee compare to Apis mellifera.

4.3 Management

- Inspect the beehives at least once in a week during the honey-flow seasons preferably during the morning hours.
- Clean the hive in the following sequence, the roof, super/supers, brood chambers and floorboard.
- Observe the colonies regularly for the presence of healthy queen, brood development, storage of honey and pollen, presence of queen cells, bee strength and growth of drones.
- Look for the infestation by any of the following bee enemies.
- Wax moth (*Galleria mellonella*): Remove all the larvae and silken webbings from the combs, corners and crevices of bee box.
- Wax beetles (*Platybolium sp*.): Collect and destroy the adult beetles.
- Mites: Clean the frame and floorboard with cotton swabs moistened with freshly made potassium permanganate solution. Repeat until no mites are seen on the floorboard.

Management during lean season

- Remove the supers and arrange the available healthy broods compactly in the brood chamber.
- Provide division board, if necessary.
- Destroy queen cells and drone cells, if noted.
- Provide sugar syrup (1:1) @ 200 g sugar per colony per week for Indian bees.
- Feed all the colonies in the apiary at the same time to avoid robbing.

- Management during honey flow season
- Keep the colony in sufficient strength before honey-flow season.
- Provide maximum space between the first super and the brood chamber and not above the first super.
- Place queen excluder sheets in between brood and super chamber to confine the queen to brood chamber.
- Examine the colony once in a week and frames full of honey should be removed to the sides of the super. The frames, which are three-fourth filled with honey or pollen and one-fourth with sealed brood should be taken out of brood chamber and in its place empty combs or frames with foundation is added.
- The combs, which are completely sealed, or two-third capped may be taken out for extraction of honey and returned to supers after honey extraction.

Equipment:

- **Hive:** It is a simple long box covered with a number of slats on top. The rough measurements of the box should be around 100 cm of length, 45 cm of width and 25 cm in height. The box should be 2 cm thick and the hive must be glued and screwed together with entrance holes of 1 cm wide. The slats (top bars) must be as long as the hive is wide in order to fit across and the thickness of about 1.5 cm is sufficient to support a heavy honey comb. The width of 3.3 cm needs to be given to give the bees the natural spacing they need to easily build one comb to each separate top bar.
- **Smoker :** It is the second important piece of equipment. This can be made from a small tin .We use the smoker to protect ourselves from bee stings and to control the bees.
- **Cloth:** to protect our eyes and nose from stings at the time of work near the apiary.
- **Knife:** It is used to loosen the top bars and to cut of the honey bars.
- **Feather:** To sweep the bees from the comb.
- Queen Excluder & Match box

Harvesting Honey

1. Harvest the honey by smoking (optional) the bees off the parts, which needs to be harvested and cut the combs carefully.
2. A ripe comb is light in colour and filled with honey. More than half of the honey cells on both the sides are sealed with wax.
3. Extract honey by using centrifugal mechanical extractor.
4. Harvests are normally possible during and shortly after the two main flowering seasons, namely October/November and February-June.

4.4 **Winter survival**: In cold climates, honey bees stop flying when the temperature drops below about 10°C (50°F) and crowd into the central area of the hive to form a "winter cluster ". The worker bees huddle around the queen bee at the center of the cluster, shivering to keep the center between 27°C (81°F) at the start of winter (during the broodless period) and 34°C (93°F) once the queen resumes laying. The worker bees rotate through the cluster from the outside to the inside so that no bee gets too cold.

The outside edges of the cluster stay at about 8–9°C (46–48°F). The colder the weather is outside, the more compact the cluster becomes. During winter, they consume their stored honey to produce body heat. The amount of honey consumed during the winter is a function of winter length and severity, but ranges in temperate climates from 15 to 50 kg (30 to 100 pounds).

Foragers coming in loaded with pollen on the hive landing board

4.5 Swarming & Absconding

There are two type of swarming – reproductive & absconding. Reproductive swarming involves splitting of colony and movement of the old queen to a new nest site, while the new queen stage with the remaining colony and all its resources – honey, pollen, brood in the old nest site. It generally occurs when conditions are favourable and floral resources are abundant. Absconding is also behavioural trait common in Apis cerana during unfavourable conditions. Absconding are of two types – seasonal / migration (movement of a whole colony due to resource depletion, declining nest site quality, disturbance due to natural calamities). Seasonal absconding involves a period of time preparing for the move prior to moving when foraging, honey & brood levels are reduced.

4.6 Communication: Honey bees are known to communicate through many different chemicals and odors, as is common in insects, but also using specific behaviours that convey information about the quality and type of resources in the environment, and where these resources are located. The details of the signalling being used vary from species to species; for example, the two smallest species, Apis andreniformis and A. florea, dance on the upper surface of the comb, which is horizontal (not vertical, as in other species), and worker bees orient the dance in the actual compass direction of the resource to which they are recruiting.

Apis mellifera carnica honey bees use their antennae asymmetrically for social interactions with a strong lateral preference to use their right antenna.

4.7 Predators

The predators are of small size to the biggest. These are insects, ants, lizards, snakes, birds, monkey, bear, etc. Pesticides spray to other crops is lethal to honey bees.

4.8 Products & Services

- **Pollination**: Species of Apis are generalist floral visitors, and will pollinate a large variety of plants, but by no means all plants. Of all the honey bee species, only Apis mellifera has been used extensively for commercial pollination of crops and other plants. The value of these pollination services is commonly measured in the billions of dollars. Bees collect 66 pounds of pollen per year, per hive.

- **Honey:** Honey is the complex substance made when the nectar and sweet deposits from plants and trees are gathered, modified, and stored in the honeycomb by honey bees as a food source for the colony. All living species of Apis have had their honey gathered by indigenous peoples for consumption, though for commercial purposes, only A. mellifera and Apis cerana have been exploited to any degree.

- **Nectar**: Nectar, a liquid high in sucrose, is produced in plant glands known as nectaries. It is an important energy resource for honey bees and plays a significant role in foraging economics and evolutionary differentiation between different subspecies. It was proposed through an experiment conducted with the African honey bee, A. M. scutellata, that nectar temperature impacts the foraging decisions of honey bees.

- **Beeswax**: Worker bees of a certain age will secrete bees wax from a series of glands on their abdomens. They use the wax to form the walls and caps of the comb. As with honey, beeswax is gathered by humans for various purposes.

- **Pollen**: Bees collect pollen in the pollen basket and carry it back to the hive. In the hive, pollen is used as a protein source necessary during brood-rearing. In certain environments, excess pollen can be collected from the hives of A. mellifera and A. cerana. It is often eaten as a health supplement.

- **Propolis**: Propolis or bee glue is created from resins, balsams, and tree saps. Those species of honey bees that nest in tree cavities use propolis to seal cracks in the hive. Dwarf honey bees use propolis to defend against ants by coating the branch from which their nest is suspended to create a sticky moat. Propolis is consumed by humans as a health supplement in various ways and also used in some cosmetics.

- **Economic Importance:** Pollination by honey bees contributes significantly to global food production. Bees pollinate more that 30% of the food we eat. In addition to providing pollination services, honey bees also produce other products that people use including honey, pollen, wax, royal jelly, and propolis and bee venom.

4.9 Comparison of Apis cerana vs Apis mellifera

Sl. No.	Details	Apis cerana	Apis mellifera
1	Native	India	Australia – European
2	Size of Bee	Smaller	Bigger
3	Active / Quickness	Quick	Sluggish
4	Type of Beekeeping	Stationery	Migratory
5	Honey yield	Low	Very high
6	Pollen collection	Low	High
7	Propolis	Nil	Yes
8	Sugar feeding	Low	High
9	Susceptibility to predator	Low	Very high
10	Impact of Climate	Low	High

4.10 Competition between Apis cerana & Apis mellifera: These two species have competition for same floral resources. They do have preference for different floral species to harvest nectar. Robbing honey from other hives is also observed between these two bee species when floral resources are declined / exhausted. Smaller hives are more susceptible by the attack. Apis mellifera guards its colony better than Apis cerana. It is observed that, the interference by one species on the other. Drons of Apis cerana are attracted by queen of Apis mellifera and vice-versa. As a result, the disaster is queen does not lay eggs. So, colony propagation halts. It is also notice that the mating season of these two species are at the similar times results in this kind of disaster.

4.11 Defense

Apis cerana japonica forming a ball around two **hornets**: The body heat trapped by the ball will overheat and kill the hornets.

All honey bees live in colonies where the workers sting intruders as a form of defense, and alarmed bees release apheromone that stimulates the attack response in other bees. The different species of honey bees are distinguished from all other bee species (and virtually all other Hymenoptera) by the possession of small barbs on the sting, but these barbs are found only in the worker bees. The sting and associated venom sac of honey bees are also modified so as to pull free of the body once lodged (autotomy), and the sting apparatus has its own musculature and ganglion, which allow it to keep delivering venom once detached. The worker dies after the sting becomes lodged and is subsequently torn loose from the bee's abdomen.

This complex apparatus, including the barbs on the sting, is thought to have evolved specifically in response to predation by vertebrates, as the barbs do not usually function (and the sting apparatus does not detach) unless the sting is embedded in fleshy tissue. While the sting can also penetrate the membranes between joints in the exoskeleton of other insects (and is used in fights between queens), in the case of Apis cerana japonica, defense against larger insects such as predatory wasps (e.g. Asian giant hornet) is usually performed by surrounding the intruder with a mass of defending worker bees, which vibrate their muscles vigorously to raise the temperature of the intruder to a lethal level.[13] Previously, heat alone was thought to be responsible for killing intruding wasps, but recent experiments have demonstrated the increased temperature in combination with increased carbon dioxide levels within the ball produce the lethal effect. This phenomenon is also used to kill a queen perceived as intruding or defective, an action known to beekeepers as 'balling the queen', named for the ball of bees formed.

In the case of those honey bee species with open combs (e.g., A. dorsata), would-be predators are given a warning signal that takes the form of a "Mexican wave" that spreads as a ripple across a layer of bees densely packed on the surface of the comb when a threat is perceived, and consists of bees momentarily arching their bodies and flicking their wings.

Chapter – 5 : Floral Cycle with Botanical Names of Flowering Plants

The floral cycle is nothing but flowering season of plant flora. It is providing pollen and nectar to bees. Nectar will be converted into honey – reserve food and pollens as immediate food for the bees. The floral cycle is directly helpful for beekeeping activity. It is an essential information required for every beekeeper to organize annual Apiculture activity by mapping geographical flora in the vicinity of the apiary / apiculture activity. All the beekeepers should prepare floral cycle and update from time to time regarding the flowering plants and flowering season to avail maximum economical benefit from beekeeping activity. So, the floral cycle is given for selected flowering plants, provide nectar & pollen to the bees. This list may be extended based on local geographical condition of the flora.

Floral Cycle with Botanical Names of Flowering Plants

Sl. No.	Crops / Flowering Plants		Flowering Months in a Year											
	Common Name	Botanical Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Albizia	Albizia lebbeck					✿	✿						
2	Annonaceous	Anona reticulata				✿	✿	✿						
3	Antigonon	Antigonon leptopus	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
4	Arecanut	Areca catechu	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
5	Aster	Aster amelius	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
6	Bael Fruit	Eagle marmelos				✿	✿							

7	Bajra	Pennisetum glaucum								✿	✿			
8	Banana	Musa paradisiaca	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
9	Beans	Phaseolus vulgaris	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
10	Bengal Gram	Cicer aritinum L												✿
11	Benzoin	Styrax **benzoin**											✿	✿
12	Ber	Ziziphus jujuba									✿	✿	✿	
13	Blackberry	Rubus fruticosus				✿	✿							
14	Blackgram	Vigna mungo L.								✿	✿			
15	Bottle brush	Callistemon acuminatus	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
16	Brinjal	Solanum melongena	✿								✿	✿	✿	✿
17	Cardamom	Elettaria cardamomum					✿	✿						

Floral Cycle with Botanical Names of Flowering Plants contd.

Sl. No.	Crops / Flowering Plants		Flowering Months in a Year											
	Common Name	Botanical Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
18	Carrot	Daucus carota		✿	✿									
19	Cashewnut	Anacardium occidentale (LINN.)					✿	✿						
20	Castor	Ricinus communis	✿	✿	✿	✿						✿	✿	✿
21	Catchu	Acacia catchu			✿									
22	Cauliflower	Brassica oleracea	✿	✿	✿									
23	Century Plant	Agave americana			✿	✿								
24	Chilly	Capsicum annuum	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
25	Champaka	Michelia champaca	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
26	Chrysanthemum	Chrysanthemum indicum L.									✿	✿		
27	Cinnamon	Cinnamomum zeylanicum	✿	✿										
28	Citrus Fruits	Citrus species										✿	✿	
29	Clove	Syzygium aromaticum				✿	✿	✿						
30	Coconut	Cocos nucifera	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
31	Cocoa	Theobroma cacao L					✿	✿						
32	Coriander	Coriandrum sativum	✿	✿	✿	✿						✿	✿	✿
33	Cotton	Gossypium hirsutum	✿	✿	✿	✿								✿
34	Cow peas	Vigna unguiculata							✿	✿				
35	Coffee	Coffea arabica L/robustae	✿								✿	✿	✿	✿
36	Cucumber	Cucumis sativus				✿	✿	✿	✿	✿	✿	✿		
37	Curry	Murraya Koenigii			✿	✿								
38	Date Palm	Phoenix dactylifera	✿	✿	✿									
39	Dattur	Datura metel		✿	✿									
40	Drumstick	Moringa oleifera	✿	✿									✿	✿
41	Eucalyptus	Eucalyptus camaldulensis		✿	✿	✿								
42	Gourd-Bottle	Lagenaria siceraria S.				✿	✿	✿	✿	✿	✿	✿		
43	Bitter gourd	Momordica charantia								✿	✿	✿		
44	Gingelly Seeds	Sesamum Indicum										✿		
45	Grapes	Vitis species				✿	✿						✿	✿

Floral Cycle with Botanical Names of Flowering Plants contd.

Sl. No.	Crops / Flowering Plants		Flowering Months in a Year											
	Common Name	Botanical Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
46	Green Gram	Vigna radiata L							✿	✿				
47	Groundnut	Arachis hypogaea							✿	✿				✿
48	Guava	Psidium guajava				✿	✿	✿	✿	✿	✿			

49	Gulmohar	Delonix Regia				✿	✿							
50	Horse Gram	Macrotyloma uniflorum									✿	✿	✿	✿
51	Jasmine	Jasminum officinale LINN		✿	✿	✿	✿	✿						
52	Jamun Fruit (Black)	Eugenia jambolana									✿	✿	✿	
53	Jowar	Sorghum bicolor								✿	✿			
54	Kharbuj	Cuccumis melon				✿	✿	✿	✿	✿	✿	✿		
55	Kunta Nerale	Syzygium caryophyllatum L					✿	✿	✿	✿				
56	Ladies Finger	Abelmoschus esculentus	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
57	Litchi	Litchi chinensis	✿	✿	✿									
58	Linseed	Linum Usitatissimum							✿	✿	✿			
59	Maize	Zea mays						✿	✿	✿	✿			
60	Mango	Mangifera indica	✿	✿	✿	✿								
61	Marigold	Tagetes erecta									✿	✿		
62	Mustard	Brassica juncea								✿	✿	✿	✿	
63	Naga sampige	Mesua ferrea											✿	✿
64	Neem	Azadirachta_indica		✿	✿	✿								
65	Niger Seeds	Hyoscyamus niger							✿	✿	✿	✿		
66	Oil Palm	Elaeis guineensis	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
67	Onion	Allium cepa		✿	✿	✿	✿							
68	Paddy	Oryza sativa L										✿	✿	

Floral Cycle with Botanical Names of Flowering Plants contd.

Sl. No.	Crops / Flowering Plants		Flowering Months in a Year											
	Common Name	Botanical Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
69	Papaya	Carica papaya	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
70	Passion fruit	Passiflora edulis	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
71	Peas	Pisum Sativum	✿											✿
72	Pepper	Piper nigrum					✿	✿						
73	Pomegranate	Punica granatum				✿	✿							
74	Pongenia	Pongenia Pinnata		✿	✿	✿								
75	Potato	Solanum tuberosum	✿								✿	✿	✿	✿
76	Pumpkin	Cucurbita species				✿	✿	✿	✿	✿	✿	✿		
77	Radish	Raphanus sativus		✿	✿	✿								
78	Ragi	Eleusine coracana			✿	✿						✿	✿	
79	Rangoon creeper	Combretum indicum	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
80	Rape	Brassica napus L								✿	✿	✿	✿	
81	Rose	Rosa species	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
82	Rose Apple	Syzygium jambos			✿	✿								
83	Rubber Tree	Hevea brasiliensis			✿	✿								
84	Safflower	Carthamus tinctorius												✿
85	Sandal wood	Santalum album	✿	✿	✿	✿	✿	✿	✿					
86	Sapota	Manilkara zapota						✿	✿	✿				✿
87	Sesame	Sesamum Indicum						✿	✿					
88	Shikakai	Acacia concinna	✿									✿	✿	✿
89	Soapnut	Sapindus laurifolius	✿											✿
90	Soybean	Glycine max				✿	✿							

Floral Cycle with Botanical Names of Flowering Plants contd.

Sl. No.	Crops / Flowering Plants		Flowering Months in a Year											
	Common Name	Botanical Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
91	Spinach	Spinacia pleraca	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
92	Strawberry	Fragaria x ananassa			✿	✿								
93	Sugarcane	S\accharum officinarum									✿	✿	✿	✿
94	Sunflower	Helianthus annuus											✿	✿
95	Sweet Potato	Ipomea batatas		✿	✿									
96	Tamarind	Tamarindus indica					✿	✿	✿					
97	Teak	Terminalia species			✿	✿	✿	✿						
98	Terminalia	Terminalia bellirica			✿	✿								
99	Thonde	Coccinia indica				✿	✿	✿	✿	✿	✿	✿		
100	Tomato	Lycopersicum esculentum Mill	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
101	Tube Rose	Polianthes tuberosa	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
102	Touchmenot	Mimosa pudica	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿	✿
103	Tur Dhal	Cajanus cajan											✿	✿
104	Tulasi	Ocimum tenuiflorum			✿	✿	✿							
105	Venila	Vanilla planifolia												✿
106	Watermelon	Citrullus lanatus												✿
107	Wheat	Triticum species						✿	✿					✿

Note: 1. Flowering season for the agriculture crops varies from location to location based on agro climatic conditions.
2. The flowering season for agriculture crops under irrigation differs from dry / rainfed crops.

Chapter – 6 : Effectiveness of Madhuvana & Apiculture Scheme

6.0 Effectiveness of the scheme has been assessed based on the interaction with 605 beneficiaries under the SBY, Madhuvana & Apiculture development scheme through Focus Group Discussion (FGD) and discussions with stake holders including officials, societies and progressive beekeepers. The zone-wise and district-wise villages covered and sample size is given in Annexe – 2.

6.1 Highlights of the Study

Highlights on the outcome of the study based on the Focussed Group Discussions with the beneficiaries, interaction office bearers of beekeeping societies and discussion with the stakeholders;

- There are two varieties of Apis cerana viz., red & black. The black variety is more furious than red variety.
- Majority (95%) are practicing Apis cerana in the state.
- Apis mellifera beekeeping is practiced in Dakshina Kannada & Uttara Kannada Districts only.
- Stationery beekeeping activity is prominent in the State.
- Migratory beekeeping activity is very rare in the State.
- Apis mellifera has been tried in many places in the past but could not succeed in maintaining and propagating further. So, they have lost the colony forever.
- On the whole, beekeeping activity is not very serious business in the State but it is a hobby and passive activity along with dominant horticulture activity.
- The beneficiaries are trained in the first level and given bee boxes with colony in these two skills. They are interested in expanding the activity with limited resources.
- Information about other products of beekeeping like Pollen collection, Royal jelly, Bee venom, Bees wax other than honey and crop yield is not known to the beneficiaries / beekeepers.
- The prospective beekeepers need higher level of training in beekeeping along with knowledge about other bee products.
- A knowledge of colony division for expansion of beekeeping activity and also generate revenue by selling bee colony is limited.

- Awareness about beekeeping in dry & plain areas and also in other areas of all the 10 agro climatic zones is inadequate. Those farmers, who have knowledge about traditional beekeeping in hilly area with forest, are in beekeeping activity but there is no growth. On the contrary, some of the traditional beekeepers have lost the colony due to disease, food scarcity during non-flowering season and stop the beekeeping activity.
- Major predators of bees are snake, ants, lizardous, birds, etc.,
- Beekeeping activity is severely damaged during mango season due to spraying chemical pesticides in the neighbourhood. Further, the pesticides spray to vegetable crops and grapes cause destruction of bee colony.
- Stationery Beekeeping activity is sustained without much of effort in hilly, malnad, forest area and plantation crops. The similar activity is unable to sustain in plain & dry areas due to non-availability of vegetation. So, the migratory beekeeping practices are advised but the farmers require adequate knowledge about beekeeping and migratory beekeeping practices.
- Some of the beneficiaries are in the initial stages of colony development could not offer any opinion regarding honey yield, increase in population due to bee pollination, facilitation service and other products.

- Honey Coop. Societies in Sakleshpur, Kodagu, Uttara Kannada and other places do not receive honey from local sources for processing and marketing honey. These Societies are procuring raw honey from North India for processing, bottling & marketing honey.
- Hardly few Beekeepers Cooperative Societies are engaged in collection of honey from local sources (Apis cerana) due to high cost but they are collecting wild honey (Apis dorsata) and imported honey from North India at low price.
- LAMP societies are catering to the development units of tribals in the State. They have various activities, which include collection & marketing of honey.
- LAMP societies at Bhagamandala & B R Hills are engaged in collection of forest honey and sell in bulk to pharma companies engaged in manufacture of ayurvedic & other medicinal products. Bhagamandala LAMP society has not collected any honey during the previous financial year.
- More than 95% of the beekeepers sell raw honey locally against orders due to collection of small quantities like 5 kg., 10 kg., at a time.
- Apis cerana honey yield ranges from 3 kg / annum to as high as 25 kg / annum / box depend on the location, availability of floral nectar and division beekeeping practices.

- Price of raw honey sold locally and directly to the consumer is ranging from Rs.250/kg to Rs.650/kg depends on location, availability and demand for honey.
- Beekeepers Co-op. Societies collect raw honey at Rs.120 to Rs.170 per kg. So, local beekeepers do not sell the raw honey to these Societies. The processed honey is priced at lowest price compare to the price of raw honey from beekeeping.

- Mechanical extraction of honey is practiced by these beekeepers due to active involvement of department beekeeping assistants who carry mechanical extractor to help them extract honey and save the hive for future collection of honey.
- Majority of the beneficiaries extract honey by using mechanical extractor with the help of local beekeeping assistance.
- The foundation sheet which saves time & money for the beekeepers is manufactured in Madikeri and supplied through Beekeepers Co-op. Societies. Many beneficiaries do not know, where to buy the foundation sheets.
- Madhuvanas set up by horticulture department are functioning and helping to propogate bee colonies for beekeepers to the limited extent.
- Farmers are interested to try Apis mellifera colonies in stationery beekeeping practice but it requires migration to provide adequate floral nectar to collect more honey and generate other products, which are of economic importance.
- The geographical area with forest, collection of large volume of honey by wild bee - Apis dorsata. This honey is available at lower price compared to honey from Apis cerana. The customers complain that the cheaper honey is being adulterated with honey from Apis cerana.
- The beneficiaries do not have any precise idea about floral calendar and its usefulness in beekeeping activity.
- The increase in crop yield due to beekeeping observed by beneficiaries is an approximation.
- The availability of floral nectar in coffee plantation is restricted to mainly coffee flowering season. So, honey yield is very low in this area. Other flowering plants are scarce in this location due to coffee plantation.
- Honey yield is prominent where coconut and areca nut gardens along with other flowering vegetation are available.
- Farmers want free bee boxes with colony for expansion and propagation of beekeeping activity.

- Drought situation is hampering beekeeping activity and many colonies were loosed due to swarming.
- Some of the government officials, bank officials, employees of horticulture department have Apis cerana colonies in their gardens as hobby and production of honey for own use.
- The forest honey – Apis dorsata is being collected by the tribals in forest area and sells to LAMP societies in their respective locations at lower price (Rs.120 to Rs.170 per kg). The tribals are not showing much interest in beekeeping activity since the wild honey is readily available in the forest.
- The facilities in Bhagamandala Beekeeping Training Institute are inadequate needs upgradation.
- In the dry agro climatic zones are mainly rain fed short term crops with minor irrigation crops. The stationery beekeeping in these zones is sporadic.
- About 75% of raw honey from Apis cerana is sold without brand name. Only few brand names of individual beekeepers are seen in the market like Prakruthi Honey, Giridarshini, CBK Madikeri, Chandana, Cauveri Honey.
- Bottled honey in glass bottles, pet bottles and second hand glass bottles are sold with label and without label in local shops. Extensive sale is observed in Madikeri. The sale of honey with comb (Apis cerana) is also seen in Madikeri.
- Varieties of honey based on flowering season are known to beekeepers in Kodagu district. Based on the season, type of honey the rate is fixed for raw honey.
- The Scheme has achieved expansion of high yield by beekeeping.
- All the organizations related Apiculture have played their role in imparting knowledge about beekeeping during training and field demos to all the beekeepers & beneficiaries.
- The department had Madhu Mahotsavas in various places to popularize beekeeping but it needs to be taken to higher level in order to create awareness and expansion of the activity. Publicity materials in the form of booklets, pamphlets have been printed and distributed for propaganda to benefit the public.
- Success rate of the scheme – Suvarna Bhoomi Yojana, District & State Sector Scheme for Madhuvana & Beekeeping Development Schemes is reasonably good.

6.2 Response Analysis

The following table gives the response received from the beneficiaries and the effectiveness of the scheme based on the coverage of 605 respondents.

Sl. No.	Parameter	%age of response

1	Type of assistance	
a)	Training	100
b)	Supply of bee boxes with bee colony	100
2	Gender	
a)	Male	83
b)	Female	17
c)	Youth – Male & Female	52
3	Social category	
a)	SC/ST	17
b)	General / Others	83
4	Boxes supplied as per the Scheme	
a)	Yes	100
b)	No	-
5	Quantity of production of honey / box	
a)	Upto 4 kg	40
b)	4 kg to 8 kg.	55
c)	8 kg & above	5

Sl. No.	Parameter	%age of response
6	No. of persons engaged in beekeeping activity	
a)	One	80
b)	One & above	20
7	Average annual income from beekeeping	
a)	Upto Rs.10,000	72
b)	Rs.10,001 to Rs.50,000	22
c)	Rs.50001 & above	6
8	Source of Honey from (Bee Species)	
a)	Apis cerana	81
b)	Apis mellifera	2
c)	Apis dorsata	15
d)	Apis florea & Apis trigona	2
9	Marketing of the honey / bee products	
a)	Directly to the Consumers	76
b)	Local Market	5
c)	Through Society	19
10	Market Rate for Honey	
a)	Apis cerana & Apis mellifera (Rs./kg)	350 - 650
b)	Apis dorsata (Rs./kg)	250
c)	Apis florea & Apis trigona (Rs./kg)	1000 - 1200
11	Quality of Honey	
a)	Raw honey	81
b)	Processed honey (societies)	18
c)	Certified honey	1
12	Mode of honey extraction and processing	
a)	Manual	21
b)	Mechanical	79
13	Awareness of Floral mapping based on flowering season	
a)	Yes	3
b)	No	97

Sl. No.	Parameter	%age of response
14	Problem faced if any	
a)	Supply of bee boxes with colony after the training	
i)	Yes	-
ii)	No	100
b)	Disease (Bees)	39
i)	TBD	17
ii)	Wax moth	16
iii)	Others	6
c)	Marketing Problem	
i)	Yes	12
ii)	No	88
15	Suggestions for improvement in the scheme for encouraging beekeeping activity.	

6.3 Status of Madhuvanas

Madhuvanas have been established in chosen few locations based on potential existed for beekeeping. The role of Madhuvana is for propagation of bee colonies and honey production. In addition to this, Madhuvanas in few locations are utilised for practical training of beneficiaries in beekeeping. Some of the Madhuvanas are in open field and others are in the metallic cage like structure for providing security and ideal conditions for beekeeping. The present status of these Madhuvanas located in 22 districts comes under all 10 agro climatic zones is provided in Annexe – 3.

TECSOK Team has visited to Madhuvanas at Doddaballapur & Hosakote in Bangalore Rural District, Horticulture Department Madhuvana in Tumkur, Gubbi, Tumkur District, Belur Madhuvana in Hassan District, Chandrapalli – Konchavara in Chincholi Taluk, Gulbarga District, B R Hills in Chamarajanagar District (not operating), Shanthahalli & Madapura (not working), Somwarpet Taluk, Kodagu District.
Madhuvanas & Training Centres are located at Bhagamandala at Kodagu District; Kukundoor village, Karkala Taluk, Udupi District; Iide village, Puttur Taluk, Dakshina Kannada District; Bilagi village, Siddapur Taluk, Uttara Kannada District; Alnavar Madhuvana & Training Centre in Dharwad District, Jamboti in Belgaum District, Mudigere Madhuvana & Training Centre (not working), Hesagal in Chickmagalur District.

It is observed that, some Madhuvanas are involved in multiplying bee colonies and production of honey similar to the practices adopted by some of the prominent beekeepers. There is no facility to develop disease resistant bee colonies in Madhuvanas

and supply them to the farmers, which is the mandate of the scheme. However, bee colonies are being given to farmers from these Madhuvanas on routine basis. The colony multiplication and supply of bee colonies to the farmers is much less compare to the demand in respective locations. The process of bee colony multiplication needs to be enhanced to meet the present demand and future expansion across the State. Presently, some of the prospective beekeepers are multiplying colonies and selling at the rate fixed by the Department of Horticulture to other beekeepers. The list of prospective beekeepers met during the field visit is given in Annexe – 4.

The bee colony collection from natural sources and multiplying the colony has also been observed during field visit by some of the prospective beekeepers. If, this activity is encouraged by the department, helps both colony suppliers and colony purchasing beekeepers. The stress on Madhuvana and maintenance will be reduced.

Some of the Madhuvanas viz., B R Hills, Maddapura in Somwarpet Taluk, Kodagu District and others are not operating. Other Madhuvanas need activation to gear up in meeting the supply demands for quality bee colonies to the beekeepers. Apis mellifera colony is not found in Madhuvanas. Some of the beekeepers expressed willingness to raise Apis mellifera colonies in their fields. Few Madhuvanas with training facility are in poor condition. These may be upgraded to operate efficiently. In the present circumstances, there is need for activation of existing Madhuvanas instead of setting up new Madhuvanas in the state. There is no facility for raising disease-free bee colonies in Madhuvanas.

During the visit to some of the Madhuvanas, had discussions with Beekeeping Assistants of Department of Horticulture, ascertained that, majority of the Madhuvanas are operating and providing requisite support with available capacity to beekeepers in the respective districts. Only few Madhuvanas are requiring renovation.

Based on the interaction with beneficiaries and the stakeholders the constraints, thrust area and opportunities in the Apiculture sector are as follows:

- Lack of infrastructure for producing genetically superior queen bees for supply to beekeepers.
- Technical knowledge for efficient management of bee colonies for higher honey yield.
- Awareness about yield increase in crops by BK through pollination.
- Research for disease management & control.
- Financial Institutional support
- Consumer awareness about honey and its products
- Poor quality control for production of honey
- De-forestation

- Indiscriminate use of insecticides, pesticides, weedicides, etc.
- Global warming & unforeseen changes in climatic conditions.

Opportunities

- Beekeeping industry does not require sophisticated technology, high capital investment or infrastructure.
- Diversified agro-climatic conditions provide great potential and opportunities for development of beekeeping.
- Potential & requirement for 15 million bee colonies which will provide employment to 16 lakh persons.

- Beekeeping industry has great self help potential for the rural people, tribals, marginal and small farmers, land less labour, etc., and great opportunities as under:

  a) Honey has great food value and provides cash income.
  b) Bees wax which is twice as much costly as honey is in great demand.
  c) Other products, viz., bee collected pollen, propolis, bee venom and royal jelly are several times costlier than honey and bees wax.
  d) About one million people will get part time employment without displacing them from their homes and without sacrificing their main occupation.
  e) Providing bee pollination services to farmers for increasing crop production and productivity of honey bees – A double benefit service and processing and value added products of bee products.

Thrust Areas

- ❖ Development of quality Nucleus stock for Apis cerana & Apis mellifera.
- ❖ Queen rearing and colony multiplication
- ❖ Management of colony for crops pollination
- ❖ Control of bee diseases
- ❖ Awareness about role of honey bees in increasing crop yield through pollination
- ❖ Awareness about NBB and its membership
- ❖ Honey testing laboratory
- ❖ Backward & forward linkages for overall development of beekeeping in the area
- ❖ Designing proper area specific crop rotations for making available flora and fauna round the year

- Designing of floral maps / charts
- Planning for intensive orchards for diversified flora and fauna in the area
- Setting up of demonstration-cum-training centres
- Setting up of honey processing plants (HPP) and collection centre
- Adoption of integrated approach in implementation of activities
- Integration of various schemes of beekeeping and crop production.

Chapter – 7 : Snapshot of Economic Contribution of Apiculture

7.1 Creation of Employment in Rural Areas

Beekeeping is an associated activity with Agriculture & Horticulture activity. As such the manpower requirement for beekeeping is meagre due to less maintenance. The employment generation is prominent, if commercial and migratory beekeeping is practiced. The employment creation is one person for every 50 bee boxes in case of Apis cerana and one person for every 20 boxes in case of Apis mellifera. Since, Apis mellifera is not there in the State except few in coastal districts so, the employment generation is not substantial due to few number of bee boxes kept by each beneficiary supported under the scheme is less than 10 boxes with majority of the beneficiaries.

The employment generation in rural area among farming community is presently insignificant. It is observed during the field visit, discussions held with focus groups, LAMP societies, beekeepers cooperative societies and other stakeholders revealed that most of the beneficiaries are hobby beekeepers and not very serious about honey yield, collection of other products like pollen grains, bees wax, royal jelly and bee venom. They are not able to percept about the effect of beekeeping in increasing crop yield and improvement of quality. If commercial beekeeping is taken up by the farmers, then only the employment creation will be large on account of maintaining large number of bee boxes, transportation of bee boxes with colony for migratory beekeeping purpose. In addition to this, during migration the colonies have to be guarded and maintained to yield desirable results.

It is observed from the field visit that, the specific employment generation in rural areas is not felt due to lack of commercial beekeeping activity in these areas.

7.2 Economic Contribution to Households, Marginal & Small Farmers

The beekeeping activity has been largely practiced by Marginal & Small Farmers with land holding ranging from half an acre to ten acres of farm land. This land has mainly plantation crops like coconut, areca nut, ginger, betel leaves, fruit crops, vanilla, etc. The beekeeping activity is handy for households to look after the bee colonies, since it does not require full time attention to maintain the colonies. The mechanical honey extraction is a simple process can be handled by ladies with little bit of practice. In addition to this, it yields continuous revenue by selling raw honey and bees wax locally at lucrative price.

The colony multiplication and sale of bee colonies yield revenue to the households. It is observed during field visit, majority of the beekeepers have less than five boxes in their premises. So, the colony multiplication helps to expand beekeeping activity in the premises as well as sell the colonies to other farmers in order to propogate beekeeping activity in the surrounding area. It is a continuous income generating activity in a household scale. A single colony can be multiplied in to three colonies in a year. The income from additional two colonies will be available to households.

As mentioned below, indicates that there is tremendous increase in crop yield and improves quality of the crop. It is perceptible in case of oil seeds, onion seeds, gourd variety of vegetables, coconut, areca nut, coffee, etc. Majority of the crops yield additional income due to increase in quantity and quality of crops. In fact, beekeeping activity is predominently useful for increase in quality and quantity of crop yield. Honey and other products are of secondary importance to the crop yield. The marginal farmers of small land holdings are greatly benefitted by the pricy horticulture crops. The impact is tremendous and easily noticeable. The farmers who have colonies are aware of this fact. Unfortunately, it is difficult to convince non-beekeepers to enter into beekeeping activity unless extensive awareness needs to be taken up for the future of apiculture activity in the state.

Based on the responses received from some of the beneficiaries the increase in yield of crops due to Apiculture is given below;

Increase in Yield due to bee pollination

Sl. No.	**Horticultural Crops**	**% age Increase in yield**
1.	Orange	47 - 400
2.	Sunflower	21 - 300
3.	Niger	61 - 173
4.	Mustard	120 - 160
5.	Onion seeds	100 – 150
6.	Guava	70 - 140
7.	Rapeseed	13 - 140
8.	Coconut	70 - 80
9.	Paddy	70 – 80
10.	Guard variety of vegetables	65 – 75
11.	Cucumber	65 – 70
12.	Pumpkin	65 – 70
13.	Pomegranate	55 - 70
14.	Jower	60 – 70
15.	Areca nut	60 - 65

16.	Banana	50 – 60
17.	Maize	50 - 60
18.	Wheat	40 - 50
19.	Coffee Beans	17 - 40
20.	Pulses (Moong, Urd, Masoor, Peas, Beans, etc.)	10 - 40
21.	Citrus	7 - 33
22.	Cotton	16 - 24
23.	Papaya	5 - 10

The above table clearly indicates that the beekeeping activity also provides economic support to the farmers through increased crop yield.

The enquiry with beekeepers regarding crop yield, employment generation, income, etc., revealed the following:

1. Increase in crop yield due to beekeeping matches with published data.
2. There is no increase in direct employment for few numbers of boxes with stationery beekeeping practices.
3. There is scope for increase in rural employment if number of boxes increase to minimum of 50 in case of Apis cerana and 20 in case of Apis mellifera with migration.
4. Beekeeping activity is essential in dry & irrigated areas with short term crops to increase quality and yield by inviting apiculturist to migrate bee boxes during respective crop flowering season.
5. The annual income will be sizeable if number of boxes is increased and migratory beekeeping is practiced.

On the whole, beekeeping activity has prominent role to play in enhancing crop yield, improving quality, generating income to the beekeepers through sale of honey and other bye-products in the State.

7.3 Economic Contribution

The economic contribution of beekeeping activity is analysed by taking an example of a bee box with Apis cerana colony. The following parameters are taken to assess the economic contribution. The details are as follows:

- Single Bee box with colony initial investment (If subsidy is given, 50% is reduced) - Rs.4,000/-
- Average Honey yield / box / annum - 7 kgs
- Average price of raw honey / kg - Rs.350/-

- **Annual income from honey / box / annum - Rs.2,450/-**
- Income from colony multiplication (Nos./annum) - 3
- Price / colony - Rs.1,500/-

- **Income from sale of bee colony (2/annum) - Rs.3,000/-**
- Average crop yield / acre / annum - Rs.12,000/-
- **Increase in crop yield due to beekeeping by 30% (One box of Apis cerana / half acre of land) - Rs.3,600/-**
- Total income / annum / box (bee colony) - Rs.9,050/-
- Expenditure / annum - Rs.1,000/-
- Net Income / box of bee colony / annum - Rs.8,050/-
  (Rounded off to Rs.8,000/- per bee box with colony)

The estimate is on average basis if no swarming of bee colonies happens and no disease attack of any kind. The effective control on predators, pesticides spray in own land and neighbours land.

On the whole, households benefit economically by beekeeping and generate employment to a limited extent.

Chapter – 8 : Scope for further expansion of Apiculture Activity

Beekeeping activity is the lifeline of agriculture & horticulture activity. It provides pollination service in majority of the flora without harming the crops / flora. The migratory beekeeping is essential to increase crop yield and quality of agriculture and horticulture produce. It is essential to propogate beekeeping activity in dry areas, where the yield is very low due to scarcity of rain. There is tremendous scope for expansion of beekeeping activity. It requires serious consideration to follow up and provide need base service by the department through beekeeping assistants.

The department needs to prepare flora mapping and floral mapping from the cropping pattern every year throughout the state. Based on the acreage of crops required for beekeeping activity, the promotional steps may be taken up. For every hectare of crop area, five boxes of Apis cerana or two boxes of Apis mellifera can be placed for pollination services and honey collection along with other bye-products.

Based on the total crop area, the number of bee boxes of any one type can be calculated and the potential can be estimated. Average honey yield from Apis cerana is 7 kg/box/year. The field survey revealed that, there are beekeepers who collects 20 kg to 25 kg/box/year from Apis cerana colonies.

Apis mellifera is an European bee. The success in Karnataka is dismal due to the type of beekeeping practice (stationery) adopted, bird predator problem and climatic conditions. Apis mellifera requires migratory beekeeping practices and it yields average 40 kg/box/year. The colonies are difficult to maintain during lean flowering season.

The other products like bees-wax, pollen, propalis (Apis mellifera) and bee venom can be collected, if commercial beekeeping is practiced. These products have good demand in the market and fetch more revenue to the beekeepers.

Looking at all these aspects clearly indicate the kind of beekeeping potential available across the State, if 10% to 20% of the existing potential is harnessed, Karnataka will be notably placed on beekeeping and honey map of the Country along with Punjab, Uttar Pradesh and other States in the Country.

Chapter - 9 : Ways & Means to popularise Apiculture

9.0 The suggestions for propagation of beekeeping activity in the state based on the study is grouped under two categories viz., short term and long term suggestions. The focussed group discussions, observations made during field visits reveal that there is need for additions to be made in the apiculture scheme for effective expansion of the activity. These suggestions and strategies may be incorporated for overall development of beekeeping activity in the state for the benefit of farmers engaged in agriculture & horticulture along with beekeepers as well as the state in increasing crop yield.

9.1 Short Term Measures - Capacity building

- Provide intensive training programme at different levels for beneficiaries based on the necessity under the scheme through active participation of progressive beekeepers in the area. During the training, the importance of migratory beekeeping need to be emphasized along with other high value added products of the activity.
- To focus & propagating beekeeping activity as an entrepreneurial venture rather than a supplementary activity to support the farmers by creating intensive awareness and dovetailing the facilities available in the new Industrial Policy.
- Officers of the Department need to be trained in creating awareness about the importance of Floral Mapping for providing boost to Apiculture Sector in the State. The Department officials responsible for Apiculture need to prepare Floral Map of their respective regions and consolidate as State Floral Map. This map needs to be updated from season to season by collecting data from the field level officers. This exercise will guide the beekeepers to plan their respective beekeeping activity for maximizing to benefits.

- Arranging frequent visits of beneficiaries and progressive farmers to major beekeeping regions across the Country to instill awareness and build confidence to take up the activity and achieve progress.
- Creating wide awareness about the economic & environmental benefits of beekeeping among the potential beekeepers, beneficiaries and farmers at large. The beekeeping activity in the State is presently focusing only on honey collection. There is need to create awareness about collection of other valuable products such as pollen, bees wax, bee venom, propalis & royal jelly.
- Department to organize awareness programme to the Bankers, Insurance Companies regarding the importance of Apiculture as an income generating activity in order to

provide loans for the activity to individual beneficiaries / SHGs and also to provide Insurance cover to infuse confidence among beekeepers. This will go a long way in encouraging Apiculture as an entrepreneurial activity.

- There is shortage of field level officers, responsible for implementing the Apiculture & Madhuvana Development Schemes. The Department should take initiative to fill up the existing vacancies and appoint additional staff for giving thrust to Apiculture activity in the northern part of Karnataka where the activity is essential for crop yield but lagging behind to a large extent due to lack of staff.
- Intensive awareness at all levels need to be created among farmers & horticulturists regarding the benefits and importance of Apiculture in increasing crop yield, improving quality of agriculture & horticulture produce, medicinal importance of honey, economic importance of other products, etc. The ease of Apiculture, low cost, less manual involvement, etc., need to be highlighted to motivate farmers to take up the activity and reap the benefits.

9.2 Long Term Measures - Strengthening the Institutional Framework

- Facilitate beekeepers to form SHGs in the similar line existing in dairy sector, wherein beekeeping activity is taken up as a group activity enabling to make it more viable & income generating activity among the members of SHGs.

- Encourage SHGs to have network with the other similar SHGs in beekeeping in the region to enable operating, collection & marketing of honey & other products in large scale on commercial footing. The networking of SHGs will also enable the members to take up migratory beekeeping, which will increase income multifold by increasing honey yield and other products, which are of commercial importance.

- The existing Madhuvanas may be handed over to the interested progressive beekeepers to manage the activities under the supervision of Horticulture Department. The Department may provide initial funding from the existing schemes to upgrade basic infrastructure of Madhuvanas, wherever necessary. There is no need for promotion of new Madhuvanas unless it is absolutely necessary.

- Integrate different schemes intended for development of apiculture viz. S-25, S-21, Madhuvana & SBY of State sector and National Horticulture Mission & RKVY of the Central sector in addition to ZP scheme. There should be a common guideline in order to avoid the confusion at the field level due to multiplicity of scheme.

- Strengthen & upgrade the existing Beekeeping Training Institute at Bhagamandala, which is of tourist destination for foreigners (marked on the World Map). The training facilities attached to Madhuvanas at Chickmagalur, Dharwad, Gulbarga and other places may be upgraded with present infrastructure facilities. The Department may also look in to the feasibility of entrusting these beekeeping training facilities by involving private parties on PPP model.

- Madhuvanas may also act as a Common Facility Centre for the beekeepers in & around the region for providing necessary facilities in the field of basic low cost honey processing units, basic quality control testing facilities, guidance cell, etc. In addition to this, SHGs willing to practice beekeeping activity on an economic scale may also be encouraged to take up quality control testing & packaging facility from other SHGs.

- Establish Karnataka Beekeeping Board (KBB) in similar line with National Beekeeping Board (NBB) with the following salient features:

  - The proposed KBB may be established in Public Private Partnership mode.

- The objective of KBB is overall development of beekeeping by popularizing state of art technologies relating to nucleus stock production, capacity building and training of bee breeders and beekeepers, processing and quality control of bee products, etc.
- Promotion of scientific beekeeping and serve as advisory body to the Government on the subject.

- The Board may comprise of 10 - 15 members representing various stakeholders including beekeepers, beekeepers societies, NGOs promoting beekeeping activity, representatives of Horticulture Department, processing units, marketing agencies, etc. An officer in the rank of Additional Director, Horticulture Department may be appointed as Ex-officio Executive Director.

Chapter – 10 : Recommended Policy Changes in the Scheme

- Extend Interest Subsidy to the beekeepers / SHGs, who avail loan assistance from Banks / Financial Institutions for Apiculture.
- Introduce necessary changes in the scheme to take up activities like management of Madhuvanas, migratory beekeeping, providing common facility centre covering testing, grading, quality control & packaging of honey and honey products on PPP model.
- Linking supply of bee colonies with boxes through progressive beekeepers at a subsidized rate.
- Integrating the various existing schemes for development of Apiculture and implement single programme for effective implementation of the scheme.
- Certification & Brand Registration may be encouraged for export of honey to various overseas countries.
- Dovetail existing schemes in Agriculture & Horticulture Department for creating awareness for Apiculture among the farmers and other beneficiaries (non-Apiculturists) in all the activities of the Department.

***

Annexe – 1

Details of Districts & Taluks in Agro Climatic Zones of Karnataka

Agro Climatic Zones	Districts & Taluks
KA-1 North-east Transition Zone	**Bidar** : Bidar, Bhalki, Aurad, Basavakalyan, Humnabad **Gulbarga** : Aland, Chincholi
KA-2 North-east Dry Zone	**Gulbarga** : Gulbarga, Afzalpur, Chittapur, Sedam, Jewargi **Yadgir** : Yadgir, Shahapur, Shorapur **Raichur** : Raichur, Deodurg, Manvi
KA-3 Northern Dry Zone	**Bagalkot** : Bagalkot, Bilgi, Hungund, Jamkhandi, Mudhol, Badami **Bijapur** : Bijapur, Basavana Bagewadi, Indi, Muddebihal, Sindgi **Bellary** : Bellary, Hoovina Hadagali, Hospet, Kudligi, Hagaribommanahally, Sandur, Siruguppa, **Davanagere** : Harapanahally **Raichur** : Lingasugur, Sindhanoor **Koppal** : Koppal, Gangavathi, Kushtagi, Yelburga **Gadag** : Gadag, Mundargi, Ron, Nargund **Dharwad** : Navalgund **Belgaum** : Ramdurg, Gokak, Raibag, Saundatti, Athani
KA-4 Central Dry Zone	**Chitradurga** : Chitradurga, Hiriyur, Challakere, Molakalmur, \ Hosadurga, Holalkere **Davanagere** : Davanagere, Harihara, Jagalur **Tumkur** : Madhugiri, Pavagada, Sira, Koratagere, Tiptur, C.N.Halli **Hassan** : Arsikere **Chickmagalur** : Kadur
KA-5 Eastern Dry Zone	**Tumkur** : Tumkur, Gubbi **Bangalore Rural** : Devanahalli, Doddaballapur, Nelamangala, Hoskote **Ramanagara** : Ramanagara, Magadi, Kanakapura, Channapatna **Bangalore Urban** : Bangalore North, Bangalore South, Bangalore East, Anekal **Kolar** : Kolar, Malur, Bangarpet, Mulbagal, Srinivasapura **Chikkaballapur** : Chikkaballapur, Chintamani, Gouribidanur, Gudibande, Sidlaghatta, Bagepalli

Annexe – 1 contd.

Details of Districts & Taluks in Agro Climatic Zones of Karnataka contd.

Agro Climatic Zones	Districts & Taluks
KA-6 Southern Dry Zone	**Mysore** : Mysore, K.R. Nagar, T.N. Pura, Nanjangud **Chamarajanagar** : Chamarajanagar, Kollegal, Yelandur, Gundlupet **Tumkur** : Turuvekere, Kunigal **Mandya** : Mandya, Nagamangala, Srirangapatna, Malavalli,

	Maddur, Pandavapura, K.R. Pet **Hassan** : Hassan, Channarayapatna
KA-7 Southern Transition Zone	**Hassan** : Holenarasipur, Alur, Belur, Arakalgud **Shimoga** : Shimoga, Bhadravathi, Shikaripura, Sagara, Hosanagara **Davanagere** : Honnali, Channagiri **Mysore** : Hunsur, Periyapatna, H D Kote **Chickmagalur** : Tarikere
KA-8 Northern Transition Zone	**Belgaum** : Belgaum, Hukkeri, Chikkodi, Bailhongal **Dharwad** : Dharwad, Hubli, Kundgol **Haveri** **:** Haveri, Shiggoan, Savanur, Byadagi, Hirekerur, Ranebennur **Gadag** **:** Shirahatti
KA-9 Hill Zone	**Uttara Kannada** : Sirsi, Siddapur, Yellapur, Supa, Haliyal, Mundgod **Chickmagalur** : Chickmagalur, Koppa, Sringeri, Mudigere, Narasimharajapur **Dharwad** : Kalghatgi **Haveri** : Hanagal **Kodagu** : Madikeri, Virajpet, Somwarpet **Belgaum** : Khanapur **Shimoga** : Soraba, Thirthahalli **Hassan** : Sakleshpur
KA-10 Coastal Zone	**Uttara Kannada** : Karwar, Kumta, Honnavar, Bhatkal, Ankola **Udupi** : Udupi, Coondapur, Karkala **Dakshina Kannada** : Mangalore, Bantwal, Belthangadi, Puttur, Sulya

Annexe – 2

Field Visit Details

Sl. No.	Zone	District	Taluks	Villages	Sample Beneficiaries Nos.
1	1	Bidar	All five taluks	Bidar - Sultanpur & other taluks - Aurad, Bhalki, Humnabad & Basavakalyan	30
2	1&2	Gulbarga	Chincholi	Chandrapalli in Chincholi Taluk	40
			Other five Taluks	Jewergi, Afzalpur, Aland, Gulbarga & Chittapur	

3	3	Koppal	Gangavathi	Gangavathi Taluk - Basapatna, Anegundi, Hanumanahalli, Koppal Taluk - Indaragi & Yelburga and Kushtagi.	25
		Bellary	Hospet & other taluks	Hospet - Kaddirampura, Kamlapura, Kampli, Chilakanahatti, Mariyammanahalli, Kudligi, Sandur, H B Halli & other taluks.	20
4	4	Chitradurga	Holalkere & Hosadurga	Shivaganga, Thalaghatta, Gangapura.	15
		Tumkur	Madhugiri, Koratagere & Pavagada	Hirehalli, Maidala, Tumkur, Honnahalli, Channashetty halli, Gubbi, Uddehosakere, Dodderi & Honnavalli.	40
5	5		Tumkur & Gubbi		
		Bangalore Rural	Devanahalli, Doddaballapur & Hoskote	Devanahalli, Devanayakanahalli, Somattanahalli, Doddaballapur, Ramagovindapura, C T Gollahalli, Gonakanahalli, Gangapur & Hosakote.	60

Field Visit Details contd.

Sl. No.	Zone	District	Taluks	Villages	Sample Beneficiaries Nos.
6	6	Chamaraja nagar	All Taluks	Kollegal - Hanur, Sebinakobe & Sathyamaradi. Yalandur - B R Hills	35
7	7	Davanagere	Channagiri	Maravanji, Medagondanahalli	10
8	6 & 7	Mysore	All Taluks	Mysore - Mysore City, Dandikeri, Megalapura, Keelanapura. H D Kote - Sogalli, Ramanahalli, Anthanathapura, Saragur. T N Pur - T N Pur town, Yathanur, Vatal, Mugoor, Kallipura. Hunsur - Chondikatte, Belikere, Veerana Hosahalli. Periyapatna - Bettadapura, Muttur. Ravandur. Nanjangud - Nandagonda, Thayur.	30
9	3, 8 & 9	Dharwad	Dharwad & other taluks	Dharwad - Alnavar, Kogilageri, Ambolli, Kumbarakoppa, Dharwad city.	30
				Kalghatgi Taluk, Dummawad, Hirehonnahalli	
				Hubli - Hubli city	
				Other Taluks - Navalgund & Kundgol Taluks	
		Belgaum	All Taluks	Belgaum - Benakanahalli, Bailhongal - Mugutakhan HubliKhanapur - Jamboti, Kanakumbi, Hebbanahatti, KalmaniOther Taluks - Chikkodi, Hukkeri, Athani, Raibag, Ramdurg, Saundatti & Gokak	30

Field Visit Details contd.

Sl. No.	Zone	District	Taluks	Villages	Sample Beneficiaries Nos.
10	7 & 9	Shimoga	All Taluks	Hosanagara - Haridravathi, Karanagiri, Nittur, Masagalli, Kodur. Shimoga - Shettihalli, Hihole, Shettikere, Harakere. Thirthahalli - Agumbe, Kammaradi, Kendabailu. Sagar - Karur, Thalaguppa, Kasaba. Sorab - Nithrani, Hosabale. Bhadravathi - B R Project, Shirala Koppa, Hole Honnur. Shikaripura	40
11	4, 6, 7 & 9	Hassan	Hassan, Alur, Sakleshpur, Belur & Arasikere	Hassan taluk - Sankenahalli village, Alur taluk - Budanahalli village, Sakleshpura taluk - Balupet, Sakleshpura - Beekeepers Coop. Society, Belur taluk - Watehalli & Hosmani village, Horticulture Dept. Madhuvana at Koneralu, Arasikere taluk - Andral, Kalyadi, Kyathanahalli & Vaddarahalli.	35
12	9	Chick magalur	Mudigere & Chick magalur	Mudigere taluk - Kunnahalli, Beejavalli Horticulture Dept. farm, Hasagal Industries Dept. Training Centre for beekeepers, Kollebail, Chickmagalur taluk - Auvati, Channagondanahalli, Kadabagere, Jaladal, Moilymane, Kunnal.	35
		Kodagu	All Taluks	Madikeri - Kopatti, Bhagamandala, Cherangal, Talacauvery, Pungabettu. Somwarpet - Madapura, Shanthahalli, Jakkanahalli, Bettadahalli, Kushalnagar. Virajpet - Thithimathi, Srimangala, Kutta, B. Shettigeri, Murnad, Nopoklu, Ballamavati.	50

Field Visit Details contd.

Sl. No.	Zone	District	Taluks	Villages	Sample Beneficiaries Nos.
13	10	Uttara Kannada, Udupi & Dakshina Kannada	Puttur, Mangalore, Moodabidre, Karkala, Siddapura & Sirsi	Iride, Puttur, Pavor, Kondana, Tankemajar, Bajape, Belvi, Peradkamala, Mala, Pelakenooral, Betta, Thaniyadda, Byloor, Kukkundur, Kadkala, Kukkuje, Tyagli, Bilagi, Hagnoor, Yalugar, Kangod, Neggu & Manjuguni.	80

Annexe – 3

Location & Status of Madhuvanas in the State

Sl. No.	Districts	AE Zones	Madhuvanas			
			Nos.	Location	Activities	Land Area (Acres)
1	Bangalore (R)	5	9	Arehalli, Hosakote, Devanahalli, Nelamangala	D B Pur - Guddadahalli - Bees propagation Hosakote - Honey Prodn. Activity	D B Pur Tq - Guddada halli – 1.07
2	Bangalore (U)	5	6	Samanahalli, Vidyanagar, Kumbalgud, Kengeri, Marath Halli, Shivanahalli	-	-
3	Belgaum	3, 8, 9	1	Jamboti, Khanapur	Khanapur - Jamboti - Honey prodn. Activity.	2.00
4	Chamaraja-nagar	6	1	B R Hills	B R Hills - Honey Prodn.	-
5	Chick-magalur	4, 7, 9	6	Koppa, N R Pura, Sringeri	Mudigere - Bees propagation Koppa - Honey Prodn.	6.00
6	Chikka-ballapur	5	11	Nandi Hills, ATI - Chikkaballapur, Gauribidanur - Minakalagunte, Sidlaghatta - Devaramaralu, Ganjalagunte, Chintamani – Kaivara, Bagepalli, Gudibande	-	-

Annexe – 3 contd.

Location & Status of Madhuvanas in the State contd.

Sl. No.	Districts	AE Zones	Madhuvanas			
			Nos.	Location	Activities	Land Area (Acres)
7	Chitradurga	4	1	Chitradurga Taluk - Bheemasandra	-	-
8	Dakshina Kannada	10	8	Sulya, Puttur	D K Dist - Sulya - Bees propagation Belthangady - Laila Honey prodn.	2.00
9	Davanagere	3, 4, 7	1	Channagiri	-	-
10	Dharwad	3, 8, 9	1	Alnavar	Dharwad - Alnavar - Bees propagation	3.00
11	Gulbarga	1, 2	1	Chincholi	-	1.00
12	Hassan	4, 6, 7, 9	3	Belur, Sakleshpur, Arakalgud	Belur - Koneralu - Bees propagation	2.00
13	Haveri	8, 9	1	Hongal	-	-
14	Kodagu	9	11	Madikeri, Somwarpet, Virajpet	Madikeri - Korangala - Bees propagation Somwarpet - Shanthahalli - Honey Prodn.	3.60
15	Kolar	5	7	Bangarpet, Mulbagal, Kolar, Srinivasapura, Malur, Vemagal	-	-
16	Mandya	6	1	Mandya	-	-
17	Mysore	6, 7	1	-	Periyapatna - Hasuvinakaval - Honey Prodn.	-
18	Ramanagara	5	5	Ramanagara, Magadi, Kanakapura	-	-

Annexe – 3 contd

Location & Status of Madhuvanas in the State contd.

Sl. No.	Districts	AE Zones	Madhuvanas			
			Nos.	Location	Activities	Land Area (Acres)
19	Shimoga	7, 9	4	Hosanagar, Thirthahalli, Sagar	Hosanagar - Parappanamane - Bees propagation Thirthahalli - Agumbe - Honey Prodn.	2.00
20	Tumkur	4, 5, 6	11	Koratagere, Siddarabetta, Madhugiri, Tiptur, Tumkur, Turuvekere, C N Halli, Kunigal, Sira, Pavagada	Koratagere - Hulikunte - Bees propagation	1.20
21	Udupi	10	2	Karkala	Karkala - Kukkandur - Bees propagation	1.20
22	Uttara Kannada	10	2	Siddapur, Sirsi	Siddapur - Biligiri - Bees propagation Sirsi - Ituguli - Honey Prodn.	2.00

Annexe – 4

List of Prospective Beekeepers

Sl. No.	District	Taluk	Village	Name of Beekeeper	Mobile No.
1	Bangalore Rural	Hosakote	C T Gollahalli	Ramachandra	9632194075
			Ramagovinda pura	Muniyappa	9141480915
			Gonakanahalli	T Gopal	9901160139
2	Tumkur	Tumkur	Hirehalli	Manohar	7899804438
			Maidala	Manjunath	8095388773
			Maidala	Mangalagowramma	9740773506
			Maidala	Asha	9844759930
		Gubbi	Gubbi	Sridhar	9743323192
			Dodderi	Nanjundaswamy	9590705447
			Dodderi	Shivakumar	9742450649
			Dodderi	S Nandeeshaiah	9740881449
			Honnavalli	Ananthaswamy	9901373246
			Honnavalli	Venkatesh	8095095085
3	Hassan	Alur	Budanahalli	Nagaraj	
		Sakleshpur	Balupet	Nagaraj	7259438833
4	Chick magalur	Mudigere	Kollebailu	Rakesh K V	9845050630
5	Chitradurga	Holalkere		Bheemesh	9483377186, 9945614922
		Hiriyur	Metikurki	Shanthaveeraiah	9449726068
6	Davanagere			Parameshwarappa	9945732640
		Channagiri	Medagondanahalli	Omkarappa	9972721022
7	Koppal	Gangavathi	Basapatna	T Anil Kumar	9900440777
			Hirebenakal	G Subbarao	9900000264
8	Bellary	Hospet	Kaddirampura	Basayyaswamy	9449133154
9	Belgaum	Bailhongal	Kurugund	Dayanand Jagadish Appayyanavarmata	9964124176
		Khanapur	Jamboti - Hebbanahatti	Prabhakar M Haladankar	9448377621

List of Prospective Beekeepers contd.

Sl. No.	District	Taluk	Village	Name of Beekeeper	Mobile No.
10	Chamaraja nagar	Yalandur	B R Hills	Vasudeva Bhat	9880141442
			B R Hills	VGKK - Chakravarthi	9449599380 80226222
11	Kodagu	Madikeri	Kopatti	Narayana Bhat	9480401240
				Vasantha	9449075077
				Ganesha	9482046784
				CBK Society	9448687428
			Bhagamandala	Lamp Society	9480083417
			Cherangal	P M Kusuma / Sri Mohan Kumar	9449758451
			Bhagamandala	K Vasudeva Naik	94485822
			Talacauvery	Siragaje Mahadevappa	9448720868 9448582256
		Somwarpet	Shanthahalli	Raju	9449313701
			Shanthahalli	K S Sundar	8762933953
			Bettadahalli	K R Shankar	9482021165
12	Shimoga	Hosanagara		Vasantha Rao	8971159939
				Narayana Adiga	9980000028
			Nittur	Sridhar	9481064212
			Haniya	Narasimha Murthy	9449573235
				Ganapathi	08185 256168
			Hedli	Swamy Rao	9741504779
		Shimoga	Shettihalli	S L Eshwar	9242626481 9481851968
		Thirthahalli	Honnethalu	Chethana M T	9483856641
			Avinahalli	Nagendrasagar	9449501613
			Hosur	Ambarish Gowda	9481949944
			Malalur	Indramma	9480295210
		Sorab	Andige	B S Sangameshwara Swamy	9481985593
		Shikaripura	Bhadrapura	M S Chandrashekar	9482448443
13	Uttara Kannada	Siddapura	Tyagli	Madhukeshwara J Hegde	9480746335

Annexe – 5

TOR for Rapid Assessment of Apiculture Scheme

I. The Context

Bee keeping / Apiculture is a Cottage Industry. Bees harvest nectar and pollen from flowering plants and provide honey which is valued as food and medicine for ages. Bees are efficient pollinators in both natural and agricultural ecosystems and help in increasing the farm yields. Hence the government though it fit to have a separate scheme for promoting scientific Apiculture particularly with the species Apis cerana. Apiculture scheme was earlier with the Industries Board. It was shifted to Horticulture department during the year 2011-12 for popularizing throughout the state. The department provided additional funding under Suvarna Bhoomi Yojane for purchase of Bee-boxes and Bee-colonies in the first year of implementation. In continuation of this, during 2012-13, a budget provision of Rs.200.00 lakhs under the Head of account 2851-00-200-0-01 (Plan) was given for the development Madhuvana and Apiculture activities. Under this scheme short duration orientation training on bee keeping techniques was imparted to farmers, youth and women. Honey bee boxes and colonies were distributed at subsidized rates to the interested bee keepers. The scheme is due for up scaling in the coming years.

II. Key objectives of Madhuvana and Apiculture scheme

1. To create awareness among farmers in Karnataka on the importance of bee keeping practice for honey production and increasing farm production through bee pollination.
2. Establishment of bee nurseries and production of disease resistant bee colonies in Madhuvanas for supplying to the farmers on regular basis.
3. To distribute bee boxes and colonies to the interested bee keepers.
4. To popularize honey production and consumption through extension activities and
5. To create additional self employment opportunities in the rural areas.

Since the Horticulture Department intends to expand the Apiculture activity through increased investment, time and effort, it is considered necessary to make a rapid assessment of the experience gained in the last couple of years. It is proposed to hire an independent external agency to conduct the assessment and to provide independent feedback.

III. Terms of Reference

1. To assess the effectiveness of Madhuvana and Apiculture scheme implemented by Horticulture Department.
2. To provide a snapshot of the economic contribution of Apiculture to the participating households, particularly on the small and marginal farmers.

3. To assess the scope for further expansion of Apiculture activities in the state of Karnataka, and
4. To recommend ways and means to popularize the Madhuvana and Apiculture Scheme on a state-wide scale.

IV. Proposed methodology

Required data and information is to be collected through focus group discussion of participating farmers and some potential participants, personal interviews of key officials, honey traders, marketing agencies and other key stakeholders. It is necessary to cover all the agro-ecological regions of the state during the study. If need be, a limited survey of households may be taken up. Sample size and the justification for the same are to be provided by the participating consultants. Number of households, yield of honey in quintals, increase in the farm yields in tons and economic returns in lakh rupees will be the units of analysis.

V. Deliverables and Time Schedule

a) **Request for Proposal**: A request for Proposal (RFP) will be issued to the prospective external consultants. Each one of them will be given an opportunity to conceive the study according to their expertise and understanding and make a power point presentation in about 20 minutes to a team of senior officers in the last week of May, 2013. The proposal which is the best in terms of methodology to adequately cover the objectives of the study and modest in terms of cost will be accepted and the contract will be awarded to the agency which makes such a proposal.

b) **Inception Report**: Contract agreement will be signed with the successful bidder within a week of the award. The consultant should submit a detailed Inception Report in accordance with the guidelines that will be provided and get this approved within two weeks from the date of agreement.

c) **Field Survey and data collection:** Successful consultant will undertake the field survey and data collection work in accordance with the approved inception report and complete the same within one month of its communication.

d) **Midterm progress report**: Upon completion of the 50% of the field survey work, the consultant will submit a midterm progress report and debrief the nodal officer.

e) **Draft Evaluation Report:** A draft evaluation report should be submitted by the consultant within one month of completing the field survey work. The same will be placed before a joint committee of officers of the Horticulture Department and the KEA. It will be reviewed rigorously. The Consultant should revise the draft in accordance with the advice of the committee.

f) **Final Evaluation Report:** Final Evaluation Report incorporating the review comments on the draft should be submitted within fifteen days after the review. 25 copies of the report, along with copies of survey tools, raw field data and processed outputs should be submitted. These items and a copy of the report will be posted on the website of Horticulture Department as well as that of KEA.

VI. Payment schedule: Cost of contract will be paid in four installments as below:

- 50% will be released as advance on signing of the contract
- 30% will be released after the draft report is approved.
- 20% will be released after submitting the final report along with data etc.

VII. Nodal Officer: Sri Maheswar, Additional Director of Horticulture will act as the nodal officer for this study. He will provide additional information if needed and clarify doubts if any. He will make necessary arrangements for coordinating the field survey work.

VIII. Oversight for the study: Karnataka Evaluation Authority will provide the complete oversight for the study. All technical aspects of the study are subject their approval.

IX. Expectation from the study: The proposed study is expected to provide a strategy for expanding the Apiculture activity effectively throughout the state. It should provide the necessary inputs in terms of policy changes, modalities of implementation and convergence possibilities with a view to benefit the rural community to the maximum extent possible.

Approved
Sd/-
Chief Evaluation Officer
Karnataka Evaluation Authority
Bangalore – 560 001

Revised Terms of Reference dated 21st April 2014

(No.KEA 112 EVN 2014)

(A) With regards to terms of study it was suggested that the productivity of honey should be a parameter to be studied across the districts / agro climatic regions. The data to be collected and analysed is as to what was the quantity of honey produced per box in the year and the rate at which it was sold? Who was the buyer? A middle man or consumer? Can the yield of honey be increased and / or the rate received at selling increased using value addition / cooperative selling etc? What other measures can be suggested for the same?

(B) In case of sample design, the intention to cover "about 275 beneficiaries" seems to give an impression that the study is going to be done in a casual way suiting one's convenience and not in accordance with tenets of statistics. Care may be taken to select a finite and certain sampling intensity on the basis of statistical principles in all future studies too.

(C) The floral cycle should include botanical names of flowering plants.

(D) The life cycle of the bee Apis cerana and Apis mellifera may be provided in the beginning of the report as the study is of honey produced by these two species.

(E) The final report should conform to the points detailed in Annexure – 4.

Chief Evaluation Officer
Karnataka Evaluation Authority

Executive Summary

I. Findings of the Study

1. Karnataka Evaluation Authority has assigned TECSOK for Rapid Assessment of Apiculture Scheme for the year 2011-12 (Suvarna Bhoomi Yojana) & 2012-13 (Madhuvana & Apiculture Development Scheme of District & State Sector) in Karnataka.

2. The sample size of 605 beneficiaries and 50 stakeholders (Societies, Manufacturers, Officials & others) has been covered from 10 Agro Climatic Zones during the field survey.

3. Majority of beekeepers throughout the State practice Apis cerana beekeeping activity. It has black & red variety.

4. Majority beekeepers in the State practice stationery beekeeping with 4 – 8 bee boxes. Migration of bee colonies and its benefits are not known to the beekeepers and farmers to avail the economic benefits.

5. Apis mellifera is less known in the State except few beekeepers in coastal districts due to climatic factor. Stationery beekeeping practices for Apis mellifera is not feasible due to lack of nectar during lean flowering season.

6. The scheme targets have been achieved by training beneficiaries and providing bee boxes with colonies. The Department organised Madhu Mahothsavas, distributed pamphlets / booklets about beekeeping to beneficiaries & public. Institutions concerned to Apiculture have imparted knowledge in respective fields to the beneficiaries during training programme and in field demos.

7. Field observation indicates that, very few beekeepers have taken beekeeping seriously as economical / commercial activity. Majority of beekeepers are hobby beekeepers and not worried about the bee colony, propagation, expansion, yield, quality, branding, marketing & other aspects for overall development.

8. Honey collection from the comb is partly manual by squeezing and mainly by using mechanical centrifugal extractor. The honey collected from bee boxes is sold in the raw form locally without label / brand name in the price range of Rs.350/kg to Rs.650/kg. Honey collected during specific flowering season fetches Rs.850/kg to Rs.900/kg (Atla Honey / Soap nut Honey).

9. Beekeepers do not sell honey to local societies due to low procurement price ranging from Rs.120/kg to Rs.170/kg.

10. Beekeepers Co-operative Societies at Sakleshpur, Madikeri are mainly processing wild honey from the forest (Apis dorsata) collected by tribals, who sells at low price. The processed honey is priced in the range of Rs.220/kg to Rs.250/kg.

11. LAMP societies in B R Hills, Madikeri and in other places are procuring wild raw honey and selling in bulk to the Ayurvedic & Pharmaceutical companies within and outside the State. These societies are also procuring other forest produces in addition to honey.

12. Awareness among officials, farmers – Agriculture & Horticulture is lacking. The concentration among the trained candidates by the department is limited to beekeeping for honey collection. Knowledge about collection of other bee products - pollen, wax, propalis, bee venom, royal jelly, etc., is lacking. The increase in crop yield is not much appreciated by the farmers due to lack of quantification, education and awareness.

13. Employment generation in rural areas from beekeeping is limited due to less than 10 bee boxes maintained by each beekeeper. If, commercial beekeeping is taken up and migratory beekeeping practices are adopted, the employment generation will be very large among rural youths and women.

14. Average honey yield from Apis cerana colonies is 7 kg/box/year. There are few beekeepers, who collect as much as 20 kg to 25 kg/box/year. In a year, each colony may be divided into 3. These divided colonies are being sold at a price fixed by the department to other farmers for Apiculture. The crop yield is an additional income which is difficult to quantify. The economics of beekeeping gives net revenue of Rs.8,050/box/annum.

15. The honey is mainly sold in the raw form without brand name or label. Only few societies – Madikeri, B R Hills and Sakleshpur are selling processed honey with brand name. Very few beekeepers sell the honey in their own brand name, which are Giridarshini from B R Hills, Nisarga Honey, Cauvery Honey, etc.

16. The beekeeping activity in dry areas of the State in first 6 Agro Climatic Zones is required to be given serious effort for development and expansion. These areas are in need of Apiculture activity for increasing crop yield especially oil seeds. The hilly and forest areas have floral feed available throughout the year. So, stationery beekeeping activity sustains by itself. Honey yield is very low due to lack of flowering plants in coffee plantation areas.

II. Suggestions

Short Term - Capacity building

- Provide intensive training programme at different levels including focus on importance of migratory beekeeping.
- Propagating beekeeping activity as an entrepreneurial venture rather than a supplementary activity.
- Officers of the Department need to be trained in creating awareness about the importance of Floral Mapping for providing boost to Apiculture Sector in the State.
- Arranging frequent visits of beneficiaries and progressive farmers to major beekeeping regions across the Country.
- Creating wide awareness about the economic & environmental benefits of beekeeping among all the stakeholders in the beekeeping.
- Organising awareness programme to the Bankers, Insurance Companies regarding the importance of Apiculture as an income generating activity in order to provide loans for the activity.
- The Department should take initiative to fill up the existing vacancies and appoint additional staff for giving thrust to Apiculture activity in the northern part of Karnataka where the activity is essential for crop yield but lagging behind to a large extent due to lack of staff.
- Intensive awareness at all levels need to be created among farmers & horticulturists regarding the benefits and importance of Apiculture in increasing crop yield, improving quality of agriculture & horticulture produce, medicinal importance of honey, economic importance of other bye-products, etc.

Long Term - Strengthening the Institutional Framework

- Facilitate beekeepers to form SHGs in the similar line existing in dairy sector.
- Encourage SHGs to have network with the other similar SHGs in beekeeping in the region to enable operating, collection & marketing of honey & other products in large scale on commercial footing.
- The existing Madhuvanas may be handed over to the interested progressive beekeepers to manage the activities under the supervision of Horticulture Department.
- Integrate different schemes intended for development of apiculture viz. S-25, S-21, Madhuvana & SBY of State sector and National Horticulture Mission & RKVY of the Central sector in addition to ZP scheme. There should be a common guideline in order to avoid the confusion at the field level due to multiplicity of scheme.

- ❖ Strengthen & upgrade the existing Beekeeping Training Institute at Bhagamandala, which is of tourist destination for foreigners (marked on the World Map). The training facilities attached to Madhuvanas at Chickmagalur, Dharwad, Gulbarga and other places may be upgraded with present infrastructure facilities.
- ❖ Madhuvanas may also act as a Common Facility Centre for the beekeepers in & around the region for providing necessary facilities in the field of basic low cost honey processing units, basic quality control testing facilities, guidance cell, etc.
- ❖ Establish Karnataka Beekeeping Board (KBB) in similar line with National Beekeeping Board (NBB) with the following salient features:
  - The proposed KBB may be established in Public Private Partnership mode.
  - The objective of KBB is overall development of beekeeping by popularizing state of art technologies relating to nucleus stock production, capacity building and training of bee breeders and beekeepers, processing and quality control of bee products, etc.
  - Promotion of scientific beekeeping and serve as advisory body to the Government on the subject.
  - The Board may comprise of 10 - 15 members representing various stakeholders including beekeepers, beekeepers societies, NGOs promoting beekeeping activity, representatives of Horticulture Department, processing units, marketing agencies, etc. An officer in the rank of Additional Director, Horticulture Department may be appointed as Ex-officio Executive Director.

III. Policy changes in the Scheme

- Extend Interest Subsidy to the beekeepers / SHGs, who avail loan assistance from Banks / Financial Institutions for Apiculture.

- Introduce necessary changes in the scheme to take up activities like management of Madhuvanas, migratory beekeeping, providing common facility centre covering testing, grading, quality control & packaging of honey and honey products on PPP model.

- Linking supply of bee colonies with boxes through progressive beekeepers at a subsidized rate.

- Integrating the various existing schemes for development of Apiculture and implement single programme for effective implementation of the scheme.
- Certification & Brand Registration may be encouraged for export of honey to various overseas countries.
- Dovetail existing schemes in Agriculture & Horticulture Department for creating awareness for Apiculture among the farmers and other beneficiaries (non-Apiculturists) in all the activities of the Department.

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