

Commercial Beekeeping

(Production, processing and value addition of beehive products for income and employment generation)

Dharm Singh



COMMERCIAL BEEKEEPING

By

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**Protecting honeybees is vital for our planet.
Spread the word towards creating better environment
to save our flying friends.**

“Honeybees are fascinating & unique on the Earth among all creatures of God”. They are truly amazing and indicator of better environment. They pollinate over 80% of all flowering plants including 70 of the top 100 food crops which provide foods and life to the human and animals and greenery to the earth planet. If we destroy honeybees, we would not have a society. A nation that can't protect honeybees destroy itself. Honey, produced by bees, is a priceless food for human health. A man can steal honey from bee, but, he could never know the ‘Art of making Honey’. Bees life is like a magic well, the more you draw from it, the more it fills with water. They really always live in trouble and work for us on same day even when we broken their nests.

Both wild and managed pollinators are disappearing globally at alarming rates, thus, we are facing an “impending pollination crisis.” It is need of hour to raise voice around the world to influence Governments for protecting these valuable creatures for human Food-security, Environment-security, Livelihood-security and Life-security. Always love honeybees and protect them.

Dr. Dharm Singh
Agriculture Scientist



A wonder on the Earth

“If the honeybee disappeared off from surface of the earth, Man would have no more than four years to live.”

Albert Einstein

Dedication



My informal Mother-teacher “**Late Smt. Sarvati Devi**”, a noted social worker of Agra district, Uttar Pradesh, always educated and insisted me to love and protect all mini-creatures of God which work for us in the nature. She emphasised me during my childhood to work on development and protection of honeybees as they devote their entire life for maintaining greenery of nature and food production for others. She dedicated 42 years of her life in making downtrodden, neglected, untouched, socially backward and economically poor rural people socially strong, financially empowered and self-dependant through protection of environment, nature and all God gifted mini-creatures.

It is well clear that we are facing an “**impending pollination crisis**,” worldover as both wild and managed pollinators are disappearing at alarming rates. These dramatic declines are because of reduction in hibernating and nesting places owing to extensive agriculture, deforestation and indiscriminate use of pesticides. Thus, there is a greater need to rely on honeybees for the pollination of the crops and survival of human, animals, birds and other living-beings.

It is my moral duty to dedicate this valuable manuscript to Late Smt. Sarvati Devi, My informal Mother-teacher, beloved mother of “Rural Poor People” and Nature’s lover, to honour for her momentous, unvalued and unforgottable long sacrifice for the people of India. This text is also dedicated to those ever laborious and wonderfull little farmer friend-the Honeybees, that their labour will be appreciated with love by all those producing, using and consuming their unique products.

About The Author



Born in 1956 in Agra (U.P.), did B.Sc. Ag. (Honors.) in 1978, M.Sc. Ag. (Agronomy) in 1980, Ph.D. in 1993 and D.Sc. in 2003. He worked as Director (Research), Director (Agriculture Extension), Scientist-In-charge, Assistant Director, Senior Technical Officer and Technical Officer in different Organizations and presently holding the key position of Director General, Indian Medicinal Plants Marketing Federation (PSU).

He served the nation as distinguished Administrator, Planner, Policy maker and agriculture architect for 37 years and developed several high yielding varieties, strains of composting worms, Phyto-hydro-absorbents, drought proof technology, Phyto-growth hormones and high value Ayurvedic medicines. During his professional career, he has published 615 technical articles, authored 37 books, 112 booklets, 30 Evaluation Reports, 92 Project Reports, 180 leaflets & 86 folders and edited 252 volumes of scientific magazines as Editor. He delivered 171 talks at All India Radio, 92 at TV and presented 262 papers in National/International Seminar, Symposia & Conferences.

He was honored by S.D. National Integration Award (1992), National Van-Aushadhi Award (2001), National Honey Productivity Award (2003), Sarva Dharm Sadbhavna Award (2009), National Bio-Science Award (2010) & Environment Integration Award (2013) for outstanding contribution,. Presently, he is member of American Society of Agronomy (USA), International Society of Horticultural Sciences (Holland), Royal Horticulture Society (London), International Bee-Research Association (UK), National Honey Board (USA) and Animal Welfare Board of India. He visited 62 countries for exchange of technologies and agri-innovations.

नरेन्द्र सिंह तोमर
NARENDRA SINGH TOMAR



सत्यमेव जयते

कृषि एवं किसान कल्याण,
ग्रामीण विकास तथा पंचायती राज मंत्री
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MINISTER OF AGRICULTURE & FARMER WELFARE,
RURAL DEVELOPMENT AND PANCHAYATI RAJ
GOVERNMENT OF INDIA
KRISHI BHAWAN, NEW DELHI



MESSAGE

Agriculture is the mainstay of Indian economy as it constitutes the backbone of the rural livelihood security system. Growth of agriculture has a maximum cascading impact on other sectors, leading to the spread of benefits over the entire economy and the largest segment of population. Impact of climate change, lack of pollinators and resources degradation has recently hit this sector resulting in stagnation/downfall in production of traditional food crops.

Beekeeping is an important activity that supplements and compliments agriculture and provides nutritional and economic security to rural communities worldwide. Honeybees pollinates over 80% of all flowering plants including 70 of the top 100 human food crops and pollination value of honeybees are 20 to 200 times more than their value as honey produces. At present, we are facing an "impending pollination crisis," in India as both wild and managed pollinators are disappearing at alarming rates. About 50 million hectare are under been dependant crops for pollination in Indian which requires 3 to 9 bee colonies per hectare for adequate pollination. Even if a minimum of three colonies are considered, about 150 million colonies will be needed in India. Against this requirement, only 1 million colonies are available in India which are in-sufficient for desired pollination. In spite of wide scope, vast potential for income & employment generation, environment protection and increased demand of value-added beehive products world over, commercial beekeeping development in India remains unexplored due to lack of awareness, massive drive and authentic literature, which needs commercialization of beekeeping throughout India.

The efforts made by Indian Medicinal Plants Marketing Federation, for publishing of this book are commendable and timely. I congratulate the author of the book and Director General, IMPMF Dr. Dharm Singh for his devotion & sustained efforts in compilation and publication of this valuable text on commercial beekeeping which may be equally useful for planners, policy-makers, food-technologists, researchers, teachers, industrialists, students etc. who are intensely associated with the issue of food & nutritional security in India and abroad.

7/11/16
19/10/16
(Narendra Singh Tomar)

रमेश पोखरियाल 'निशंक'
Ramesh Pokhriyal 'Nishank'



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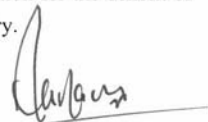
MESSAGE

I am delighted that a comprehensive new book is coming out on commercial beekeeping.

Honeybees are some of the hardest working mini-creatures of inestimable value as agents of cross pollination and indicator of better environment. Agents of pollination, the honeybees play quintessential role in nursing humans, animals and plants. A considerable portion of all human food comes from bee pollinated plant species. It is estimated that value of honeybees as agents of pollination of different agriculture, horticulture and fodder crops is many times more than the value of the honey produced. Beekeeping improves the economic condition of the farmers; restricts the migration of rural youth to urban areas and helps in holistic development of rural society. Pollination is not just important for the food we eat directly, it is vital for the foraging crops, and it helps to feed many other animals in the food chain and maintains the genetic diversity of the flowering plants.

In order to tap the immense potential of bee keeping, commercial beekeeping industry needs to be reorganised and revamped. Dr. Dharm Singh, Director General, Indian Medicinal Plants Marketing Federation, has done a commendable work by compiling valuable information on beekeeping in the form of a reference book entitled "Commercial Beekeeping". I hope and believe that the book will certainly help in commercialisation of this un-explored wonder crop in India and help in creating interest in production, processing and value-addition of beehive products and development of Bee-based food industries.

I congratulate Dr. Singh for bringing out such a useful publication for the benefit of the people involved in sustainable development of beekeeping industry.



(Ramesh Pokhriyal 'Nishank')

सबको शिक्षा, अच्छी शिक्षा।



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प्रो. ए.के. मिश्रा

अध्यक्ष

Prof. A.K. MISRA

CHAIRMAN

FOREWORD



Honeybees are the world's most important single species of pollinator in natural ecosystems and a key contributor to crop pollination and productivity enhancement. It is estimated that one third of the food that we consume each day relies on pollination mainly by honeybees, in addition to insects, birds and bats. Beekeeping is the only agro-horticulture and forest-based industry, which is nature friendly and does not require more capital investment and skilled labor. This profession can be easily adopted by well to do as well as small/marginal farmers, farm-women, landless laborers, rural unemployed youth and retired or in-service personnel. Initial costs as land and structural requirements to start this enterprise and recurring cost are also very nominal.

Insect pollination of agriculture crops is a critical ecosystem service. The value of insect pollination for worldwide agriculture production is estimated to be 153 billion tons, which represents 9.5% of the value of the world agriculture production. One third of total diet is directly or indirectly dependent on honeybee pollinated plants. We may lose all plants that bees pollinate and all of the animals that eat those plants, without honeybees. It means a world without bees could struggle to sustain the global human population of 9.7 billion by 2050. Honeybees are disappearing globally at an alarming rate due to pesticides, parasites, diseases and habitat loss. If these little insects that help provide so much of the food we eat vanish, then man would only have 4 years left to live, as per Albert Einstein.

In addition to the honey produced by the honeybees, there are also a number of valuable non-food apiary products, such as pollen, queen substance, propolis, royal jelly and bee wax; used in cleaning and beauty products and also has nutrition crafts, manufacturing, and medical applications. In order to realize the immense potential, our Prime Minister emphasized to commercialize this viable, profitable, cost-effective, need-based and employment generating activity in India with sound efforts to bee-resource management. In this endeavor, Dr. Dharm Singh, Director General, Indian Medicinal Plants Marketing Federation, has done a commendable job of compilation of very useful information on beekeeping as reference book for the popularization of this un-explored activity.

I congratulate the learned author of this book Dr. Dharam Singh for bringing out this very useful book entitled "Commercial beekeeping – Production, processing and value addition of beehive products", for the people involved in sustainable development of beekeeping industry.

(A.K. Misra)

Date: 08.11.2019

SANJAY AGARWAL
SECRETARY



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Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation
& Farmers Welfare



FOREWORD

Agriculture is not only the food producing machine but key driver of development process and backbone of livelihood system in India. Agriculture production will continue to be a high priority objective for food security, livelihood security, natural resource security, industrial development and poverty alleviation. Impact of climate change, lack of pollinators and resource degradation has recently hit this sector most violently resulting stagnation/downfall in production of traditional food crops leading to fear of high food insecurity and malnutrition.

In this task, beekeeping, an economically sustainable occupation, offers an attractive avenue for self-employment generation with multiple benefits. We are facing an "impending pollination crisis", in which both wild and managed pollinators are disappearing at alarming rates. These dramatic declines are because of reduction in hibernating and nesting places owing to extensive agriculture, deforestation and pesticides which can be hazards to these non-target organisms. In India, about 50 million hectare is under bee dependent crops for pollination which requires 3 to 9 bee colonies per hectare for adequate pollination. Even if a minimum of three colonies are considered, then about 150 million colonies will be needed in India. Against this requirement, only 1 million colonies are available in India which is insufficient resulting in a monetary loss of more than Rs.65000 crore every year. Thus, there is a greater need to augment the number of bee colonies throughout India for desired improvement in crop productivity, nutritional food, employment generation and supplement too many ayurvedic as well as herbal medicine.

In this context, efforts made by Dr.Dharm Singh, Director General, Indian Medicinal Plants Marketing Federation for compilation and publication of this knowledge resource book on "Commercial Beekeeping" are excellent and forward looking in popularization of this valuable unexplored enterprise.

I congratulate learned author Dr.Singh for his devotion and sustained efforts for publication of this valuable text which may be a very useful resource book for planners, policy makers, food technologists, researchers, teachers, industrialists, students etc. who have an access to food and nutritional security in India and abroad.

(Sanjay Agarwal)

November 26, 2019



सत्यमेव जयते

प्रो. आशुतोष शर्मा
Prof. Ashutosh Sharma



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Secretary
Government of India
Ministry of Science and Technology
Department of Science and Technology

FOREWORD

Agriculture is the key driver of development process and backbone of livelihood system in India. Agriculture production will continue to be a high priority objective not only for food & livelihoods security but also for poverty alleviation & rural development. Impact of climate change and resource degradation has recently hit this sector more violently resulting stagnation/ downfall in production of traditional food crops leading to fear of high food in-security and malnutrition. These problems are eroding the productivity of the country by 4 to 6 per cent of GDP. Cross pollinated food crops are also at stake due to deterioration of pollinators resulting downfall in yield and monetary loss. It is estimated that One third of total diet is directly or indirectly dependent on honeybee pollinated plants. Bees and beekeeping sustain our agriculture by pollinating crops and thereby increasing yields of seeds and fruits, and contribute to peoples' livelihoods. Honey and the other products obtained from bees have long been known by every society.

Thus, Bee-keeping (Apiculture) play a major role to supplements and compliments agriculture and provides nutritional and economic security to rural communities and in eco-system building. Beekeeping, as an micro-enterprise is suitable for adoption by rural tribal and other weaker sections of human society. However, with changing climatic and environmental concerns and in order to realize the immense potential, Apiculture needs to be reorganized with sound efforts towards bee resource management with organic approaches. Need is for continual development of innovative technologies and management techniques, new methods for natural and organic Apiculture operations. Such approaches for Beekeeping can led to economic upliftment of rural people and major contributor to National Agendas for future food and nutritional security. In fulfillment of this need, the book written by Dr. Dharm Singh, Director General, and Indian Medicinal Plants Marketing Federation can be a great asset to the people engaged towards adoption, and promotion of beekeeping as agro-industry with value addition of bee-hive products in organic manner.

I Congratulate Dr. Singh for bringing out this very useful contribution to the people those involved in sustainable development of beekeeping, and helping people to strengthen livelihoods and ensuring maintenance of forest habitats and biodiversity.

(Ashutosh Sharma)



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Vice-Chancellor

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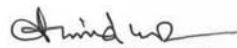
FOREWORD

In the context of agriculture based economy of India, providing ample employment opportunities, commercial bee-keeping is very pertinent as substantial and / or full-time income generating source in India. Indian forests could provide shelter and food to over 120 million bee colonies. Even if we consider decline in the forest area in recent years, the country can still hold over 100 million bee Colonies, providing self-employment to over 10 million rural and tribal households. In terms of production, these bee colonies can produce over 7 lakh tonnes of honey and about thirty thousand tonnes of bees-wax. Augmenting the number of bee colonies is essential for desired improvement in crop productivity and also for nutritionally rich food and supplement to many ayurvedic as well as herbal medicine.

Beekeeping is more acceptable, adoptable, easy and less expensive occupation over other income generating activities. Although, its family unit up to 5 colonies does not require any specific land but on an average engagement of a technical labourer for about 35 minutes per day for management is required whereas a beekeeper having 5 colonies could earn about Rs. 35 - 45 thousands per month. Beekeeping industry has been facing various problems in India like Paucity of authentic literature and transfer of proven technology of beekeeping etc, which restricted its popularity, commercialization and development of beehive-based food industries in India.

In this contest, this publication having authentic, research-based and practical information on different aspects can play a vital role. The compilation of relevant literature in book form on this potential activity by Dr. Dharm Singh, Director General, Indian Medicinal Plants Marketing Federation, is really commendable, valuable and timely.

I congratulate Dr. Singh for bringing out this key knowledge resource text which may be useful to planners, policy makers, researchers and extension workers for understanding, commercial production and utilization of this need-based, employment generating and crop-productivity enhancing activity in India.


(Arvind Kumar)

Preface

Agriculture is the backbone of Indian economy as it contributes to rural livelihood security system. It is core of planned economic development in India, as the trickled-down effect of agriculture is significant in reducing poverty and regional inequality in the country. Growth in agriculture has a maximum cascading impact on other sectors, leading to the spread of benefits over the entire economy and largest segment of the population. The rapid growth of agriculture is essential not only for self-reliance but also for meeting the nutritional food security of the people, to bring about equitable distribution of income and wealth in rural areas and reduce poverty and improve the quality of life.

Honeybee is the only insect that produces a food eaten by man. It is one of the most studied creatures in the world after man. They are important creature of God which play an important role in human life. There is a famous quote from Alvert Einten "If the bee disappeared off the surface of globe then man would only have 4 years left to live". One third of total diet is directly or indirectly dependent on honeybee pollinated plants. We may loss all plants that bees pollinates, all of the animals that eat those plants and so on upto food chain. It means a world without bees could struggle to sustain the global human population of 9 billion by 2050. We are lossing bees at an alarming rate. Possible reasons include the loss of flower meadows, the crab like varroa mite, climate change and use of pesticides. Fodder and livestock ration feed are also derived from honeybee pollinated crops. Several commercial values of temperate fruits, vegetables and nuts are self-incompatible and require cross pollination for which honeybees are the most efficient. They not only provide food and income but also enhance the productivity of field crops by their pollination activity. It has been estimated that value of honeybees as pollination of different agriculture, horticulture and fodder crops are 20 to 200 times more than their value as honey produces. It is a proven fact that beekeeping improves the economic condition of the farmers; restrict the migration of rural youth to urban areas and helps in holistic development of rural society. In addition to the honey, there are number of valuable non-food apiary

products i.e. pollen, queen substance, royal jelly, and bee wax used in cleaning and beauty products and also has a nutritional craft, manufacturing and medicinal application.

Worldwide, there are around 25,000 different types of bee species (around 4,000 in the U.S.). This huge number is divided into over 4,000 genera of bees, which are then further subdivided into just nine families of bees. The Apidae family is perhaps the most well known family, with familiar members such as the honeybee, carpenter bee, and bumblebee.

Beekeeping is the only enterprise, which did not create any problem to the nature, does not require more capital investment and skilled labour. This profession can be successfully adopted by well to do as well as small/marginal farmers, farm-women, landless labourers, rural unemployed youth and retired or inservice personnel. This enterprise has minimum land and structural requirement. Initial cost to start this profession is also very nominal and recurring cost is negligible. It is suitable for rural tribals and other weaker sections of human society. It may be adopted as full time or subsidiary occupation.

In the initial plans, huge investments were made in agricultural research and development as a result of which India became self-sufficient in foodgrain production. Special emphasis were also given to develop various agro-based enterprises like dairy, poultry, fish farming, sericulture and beekeeping with a view to maximize farm-income and self-employment. Out of these, beekeeping industry received inadequate attention resulting its poor and unorganized development in India.

In general, bees are foremost pollinators. About 30% of all human food comes from bee pollinated plant species. They play a great role in the process of pollination mainly due to their large number of foragers from the colony. About 50 million hectares in India are under bee dependent crops for cross pollination like fruits, flowers, vegetables, oil-seeds, pulses and legumes.

On other hand, the population of wild insect pollinators is on the decline because of the reduction in hibernating and nesting places owing to intensive agriculture, deforestation and cleaning of waste land and discriminate use of chemical pesticides. Consequently, hive bees have become most important pollinator which can be used with surely and as and when needed. As per the study, cross pollinated crops requires 3 to 9 bee colonies per hectare for adequate pollination. Even if a minimum of three

colonies are considered, then about 150 million colonies will be needed in India. However, only about 1 million bee colonies in India are available at present, which is far below from the present requirement. The number of bee-colonies & pollinators in India are in-sufficient. As a result, cross pollinated crops could not yield desired output due to poor or lack of pollination. Due to this reason, India get monetary loss of more than Rs. 65000 crores every year. Hence, it is almost essential to augment the number of bee colonies throughout India for desired improvement in crop productivity, nutritional food and supplement too many ayurvedic as well as herbal medicine. India has immense potential for development of beekeeping. It is estimated that the Indian forests could provide shelter and food to over 120 million bee colonies. Even if we consider reduction in the forest area in recent years, the country can still hold over 100 million bee colonies, providing self-employment to over 10 million rural and tribal families. In terms of production, these bee colonies can produce over 700000 tons of honey and about 30000 tons of bees-wax. In the context of agriculture based major employment and economy of India, bee-keeping as substantial and / or full-time income generating source is essential. In a family based activity, it is very easy, acceptable and less expensive than any other income generating activity because bee-keeping unit up to 5 colonies does not require any specific land. Nevertheless, it is unbelievable but true that required technical labor per day for management of 5 colonies may be about 35 minutes in average, where as a bee-keeper having 5 colonies could earn about Rs. 3500/- per month in average.

It may be mentioned here that in most of the 587226 inhabitate villages of India, bee-keeping is more or less feasible on the basis of existing natural bee plants. It is estimated that there would at least 5 bee-keepers in each village in average, then, there would be more than 3 million people to be engaged in beekeeping activity. By way of this, each bee-keeper on an average will produce 30 kg of honey, then there would be a total honey production of about 88,000 MT which is worth Rs. 2700 crores per year if sold at the rate of minimum Rs. 300/- per kg. On the other hand, additional crops, vegetables and fruit production as scientific records is to be of worth Rs. 3000 crores. Thus, it is to be appreciable that through the scientific and proper implementation and expansion of bee-keeping in India, there will be a good amount of honey production with enhanced production of field crops, vegetables and fruits. Subsequently, a

large number of employment generations is also to be happened as well.

For proper and sustainable development of beekeeping as agro-industries, conducting research projects and augmenting production of value added products, it is very important to provide scientific and authentic literature on commercial beekeeping to researchers, educational institutions, industrialists, government departments and beekeepers and create mass awareness in potential areas at National level. It is the main reason that Indian people are more or less un-known with valuable beekeeping enterprise. Thus, its industrial, nutritional and therapeutic benefits are still un-tapped.

This manuscript, written in a comprehensive and lucid style, is intended to provide scientific, authentic and very useful information on various aspects of beekeeping development in context to Indian conditions. The suggestions, comments and healthy criticisms to improve the book are heartily invited.

Dated: October 27, 2019

Dr. Dharm Singh

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We would like to express my heartfelt gratitude to Col. V. K. Sharma, Chairman, Indian Medicinal Plants Marketing Federation who allowed and facilitated me to work on mini creature honeybees and implement various research and development projects independently. I would like to thank my wife and rest of family, who supported and encouraged me in spite of all the time it took me away from them. It was a long and difficult journey for them.

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I am sure that this publication would not only be informative to the readers but also promote a concern, that every citizen of our country has an access to preserve bio-diversity, healthy life, self-employment and sufficient food.

Dated: October 27, 2019

Dr. Dharm Singh

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PART - A
BACKGROUND OF BEEKEEPING,
ANATOMY AND LIFE CYCLE OF
HONEYBEES



Background of Beekeeping

1.1 Introduction

The only lower animals that are of interest to man from time immemorial are the social insects in nature. The social insects, viz., termites, ants, wasps and bees; have a fascinating biology and exhibit a remarkable mechanism of organized life. They live in highly organised societies made up of small to large colonies and construct a variety of nests with striking architecture. The communication system among the individuals in the colony is very developed.

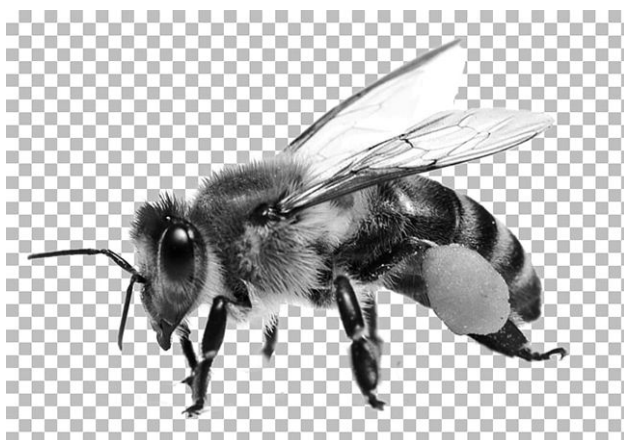


Figure 1: Honeybee (*Amazing mini creature of God on the Earth*)

Among four groups of social insects found in nature, the honeybees are one of the groups, which are directly beneficial to mankind producing not only honey and wax but also pollinating a variety of cultivated and wild plants in nature. Honey is prized as food and medicine and the uses of bee-wax are many and varied. Honeybees have admired for their industriousness, unity, self-sacrifice, division of labour and spirit of social service.

In India and several other South-East Asian countries, beekeeping has been mainly forest based. Several plant species in tropical and sub-tropical moist and evergreen types of forests provide forage (nectar and pollen) to honeybees. Thus, the raw material for production of honey is available to the beekeepers free from nature. Beekeeping neither require more investment of capital, skilled labour and

land space nor it compete with agriculture, horticulture or animal husbandry for any input. The beekeeping, is therefore, ideally suited to beekeepers as a part-time occupation.

Beekeeping constitutes a resource of sustainable income generation to the rural and tribal farmers. It provides the valuable nutrition in the form of honey, protein rich pollen and brood. Bee products also constitute important ingredients of folk and traditional medicine. The exploitation of honeybees, wax and pollination is normally termed as beekeeping. Beekeeping requires very little inputs. A bee box is the only essential requirement to start the industry. The output is comparatively quite high. For the illiterate poor in remote areas of the country, this could be an ideal occupation that could be taken up by them, besides their traditional agriculture and forest related main occupations, if any. Presently, beekeeping is low input-high output industry. The output to input ratio in the small unit of 5 colonies is low which improved as the colony number increases. In units with higher number of colonies, both productivity and efficiency get increased. These factors led the Freedom fighters, social workers and missionaries to introduce and encourage beekeeping among the rural and tribal populations, as a part of their efforts to effect social upliftment among the poor and provide them resources for self-employment.

It is estimated that Indian forest can provide shelter and food to over 100 million bee colonies at present. This can render self-employment to over 10 million rural and tribal families. In terms of production, these bee colonies can produce over 700000 tons of honey and about 30000 tons of bees wax. This can restrict the movement of rural population to urban area for employment opportunities and reduce pressure for water, electricity; housing and other scarce facilities in cities and Industrial Township.

Beekeeping has a long history in India. Honeybees evolved millions of years ago and produced honey from nectar of flowering plants that abounded in rich forest extant all over the country. Honey was the first sweet food tasted by the ancient Indian roaming tribes in these forests. They hunted beehives for this gift of God. India has some of the oldest records of honey industry in the form of paintings by prehistoric man in the rock shelters. These depicted honeybee hives and the earliest attempts to harvest honey.

Beekeeping activity is concentrated in the south-west peninsular region of the country with plantation of rubber, cardamom and coffee, dense natural vegetation alongwith Western Ghats, Jammu & Kashmir, Punjab, Himachal Pradesh, Haryana, Uttar Pradesh, Bihar, West Bengal, Assam and Meghalaya. The Sub-Himalayan ranges with natural vegetation in the northern states and the vast agricultural and horticultural fields with mustard, berseem, litchi and eucalyptus along the adjacent terai region provide a major sources of bee flora for profitable beekeeping.

Beekeeping is ideally suited to rural areas to utilize the naturally available resource from agricultural, horticultural and forest crops. Honeybees provide honey, wax, pollen, propolis, royal jelly, venom, etc. They contribute to increasing