ECONOMICS OF PRODUCTION AND MARKETING OF HONEY IN NAINITAL DISTRICT OF UTTARAKHAND

Thesis

Submitted to the

G. B. Pant University of Agriculture & Technology
Pantnagar- 263145, Uttarakhand, India

By

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B. Sc. (Agriculture)

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

Master of Science in Agriculture
(AGRICULTURAL ECONOMICS)

January, 2019

ACKNOWLEDGEMENT

Words are very poor substitute to express one's emotions and feelings, there are no other alternative to give vent to one's sentiments, particularly on an occasion like this, when one sits in acknowledging the debts of others.

With limit less humanity, I would like to praise and thank 'God' - The creator-The supreme Power- The Light or whatever He is, has helped me in all adversities, at every step, on each moment. I will remain indebted to him always because "He is the cause of every cause". Every effort is motivated by an ambition and all ambitions have an inspiration behind.

I am overwhelmed with joy to evince my profound sense of reverence and gratitude to Dr. Anil kumar, Professor, Department of Agricultural Economics and Chairman of my Advisory Committee, for his inspiring guidance, peerless but constructive criticism and continuous encouragement through the tenure of my investigation and preparation of dissertation. He has turned all the stones to complete my thesis work earlier within the due date so that I perceive in all the dimensions of life in his enlightening association.

I feel extremely privileged to express my veneration for the eminent members of my advisory committee Dr. M. l. Sharma, Professor, Department of Agricultural Economics and Dr. Virendra Singh, Professor, Department of Agricultural Economics, College of Agriculture for their authentic and technical guidance, keen interest and valuable criticism during the course of investigation and preparation of manuscript.

It is a pleasure to acknowledge the help rendered by Dr.H.N. Singh, Head and Professor, Dr S.K. Srivastava, Professor, Dr. Chandra Dev, Associate Professor, Dr. Shweta Choudhary, Assistant Professor, Dr Ruchi Rani Gangwar, Assistant Professor, Dr. Ajay Kumar Tripathi , Assistant Professor of Department of Agricultural Economics and Dr. Pramod Mall, Head Entomology for their valuable suggestions, cooperation, persistent encouragement and advice during my research work which proved to be of immense help.

I wish to extend my sincere thanks to Dean, College of Post Graduate Studies, Dean Agriculture, Director, Experiment Station, Registrar, Dean Student Welfare and University Library, G.B. Pant University of Agriculture and Technology, Pantnagar for providing me the essential facilities to conduct the proposed investigation.

Words in lexicon would be few exiguous to express my deep sense of gratitude for my Grandfather and my loving Parents, for their selfless sacrifices and heartfelt blessings throughout my life. I offer my profound indebtedness to them for whatever I am today is because of them. They were the source of inspiration during this whole period. I can never forget the immense love and care of my siblings, Anant dev and Sugandha who time to time

cheered me up whenever I needed, making my journey to the completion of this manuscript a lot easier.

A word of special thanks to Dr. Kanwal, honey bee specialist (RMPK) for their whole hearted support, and help from time to time during my investigation.

I would be failing in my duties if, I do not mention the help, guidance and constructive criticism rendered by my seniors Nikhil Pratap Singh, Ashish Devrani , Deepankar Pandey, Amit Gaur, Pawan Mall, Anil Mapwal, Himanshu Verma, Kamal Trilpathi, Nitin, Ankit kohli, Harshal Sahni, Bhupesh Punera, Arbaz Ahmad and batch mates Madhu Rawat, Giridhar, Anand, Yashpal, Rajat Arora, Pradeep Nautiyal, Devesh, Bhupendra singh, Geetha, Somya, Shubham Sati, Rohit Kumar, Sangeeta and Yogesh Pandey.

Specially to my loving juniors Charu Chand Devshali, Himanshu Pant, Abhinav Kumar, Manam Chauhan, Manish Rawat, Manoj Arya, Arun Bhandari, Gaurav Beri, Surya, Sandeep Pandey, Pratham, Mohit Arya Pushkar Bora, Aman Bohra, Himanshu Prasad, Gaurav Pokriyal, Ketan Kakkar, Mukul Sukhija, Deepak Rawat, Utkarsh Rawat, Adarsh Yadav, Abhishek Pathak , Kirti Rahul, Shivam Dhiman, Vicky Panwar, Mayank Pratap Singh Bangari, Maiteya, Manjeet, Manoj Gajrola, Mayank Mehta, Amit Singh, Arfaz, Priyam, Bhanu, Deepshikha, Akash Rajput, Aafreen, Haripal Rana, Tanuj, Pratiyush, Sumit Yadav, Manoj Danu, Sharad Chauhan, Jagjeevan Barakoti, Abhijeet, Yogesh Rawal, Chhimwal, Madhwal, Parth, Prashant Gaur, Manjari, Gurkeerat, Prakriti, Bhumika, Anjali, Tharani, Sabri, Joshi, Suraj Melkani, Chayan, Harshit, Shivani, Saurabh, Aksh Sharma, Gurmeet, Pramod, Anuj Malik, Sharad Chaturvedi, Jaswant and Sumit Gola for their continuous help and thoughtfulness throughout my degree programme.

Now the time to express my heartiest thanks to my friends, who encouraged and helped me in every struggling moment of my life.

I must mention the cooperation and help provided by Mr. S.S. Singh, Naresh bhaiya, Bhandari ji, Om Prakash bhaiya and Usha ma'am, Sanjay Gupta, Bhuvan Fartyal, Ajeet Yadav, Rocky Takuli, Harish Pathak and Atul Verma, during the course of my thesis work.

Last but not the least, I record my sincere thanks to all beloved and respected people who have helped me directly or indirectly in the successful completion of this thesis but could not find separate mention. I wish to thank all well-wishers whose blessing propelled me to achieve my dreams. Thanks to all!!!

All are not mentioned, but none is forgotten.

Pantnagar
January, 2019

(Shubham Arya)
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CERTIFICATE

This is to certify that the thesis entitled **"ECONOMICS OF PRODUCTION AND MARKETING OF HONEY IN NAINITAL DISTRICT OF UTTARAKHAND"** submitted in partial fulfillment of the requirements for the degree of **Master of Science in Agriculture** with major in **Agricultural Economics** of the college of Post-Graduate Studies, G.B. Pant University of Agriculture and Technology, Pantnagar, is a record of *bona fide* research carried out by **Mr. Shubham Arya, Id. No. 43755** under my supervision and no part of the thesis has been submitted for any other degree or diploma.

The assistance and help received during the course of this investigation has been duly acknowledged.

(Anil Kumar)
Chairman
Advisory Committee

Pantnagar
January, 2019

CERTIFICATE

We, the undersigned, members of the Advisory Committee of **Mr. Shubham Arya, Id. No. 43755,** a candidate for the degree of **Master of Science in Agriculture,** with major in **Agricultural Economics,** agree that the thesis entitled **"ECONOMICS OF PRODUCTION AND MARKETING OF HONEY IN NAINITAL DISTRICT OF UTTARAKHAND"** may be submitted in partial fulfillment of the requirements for the degree.

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Member

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Member

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Chapter 1 *INTRODUCTION*

Introduction

India is primarily an agriculture based country and its economy largely depends upon agriculture. Indian agriculture sector accounts for 17.32 per cent of India's gross domestic product (GDP) in financial year 2017-18 and provides employment to more than half of the total workforce of the country. Agriculture not only means the cultivation of land for crop production but also includes practices of allied activities such as livestock, poultry, beekeeping, sericulture etc. Beekeeping (or Apiculture) is one of such activities. It is defined as the scientific method of conservation and rearing of bees for the production of honey and other important hive products such as bee-wax, royal jelly, propolis and bee-venom. Breeding of bees for sale and use for pollination in certain crops are other important subsidiary uses.

Beekeeping involves rearing of social species such as Indian and European bee. Out of more than 20000 species of bees known in the world only a small fraction represents honey bee species. In the early 21st century only seven species of honey bee were recognized with a total of 44 known subspecies. In India only five honey bee species are found viz. *Apis dorsata (Rock bee*), *Apis florea* (Dwarf bee), *Tetragonula iridipennis* (Dammar or Stingless bee), *Apis cerana indica* (Indian hive bee), Apis *mellifera* (European or Italian bee). The first four are indigenous, while latter one has been introduced from abroad and successfully established in late sixties (1960). For commercial beekeeping in Indian conditions *Apis mellifera* is more suitable, as its production performance is much better than the other species and is less prone to swarming and absconding.

Beekeeping is an old age traditional practice in India. Earlier it was considered as a non-investment profit giving ventures in rural areas. Later its potential to develop as a prime agri-horticulture and forest based industry was recognized. Now beekeeping has emerged as an environment friendly and additional income generating economically important enterprise.

Honey bees collect pollen and nectar from the flowers as their feed. Several natural plant species provide nectar and pollen to honey bees. Thus, the raw material for production of honey is freely available from nature. More than 50 major bee flora producing plant species (Mustard, Eucalyptics, Litchi, Tejpatta, etc.) are found in plenty

throughout the country although their availability is seasonal only. However availability of flora at a particular place round the year is rarely found. This situation forces beekeepers to migrate the bee boxes regularly to avail the desired bee flora. In search of desired flora normally 6-7 migrations in a year are practiced by the beekeepers. The three months period from mid-June to mid-October is considered as dearth period. During this period either flora is not available or sometimes flora is available but bees do not forage due to adverse weather like rain, cloudiness, fog and frost as bees go in dormant stage. For the survival of bees during this distress period the sugar syrup as an artificial supplement feed is provided regularly. Indian bees are less susceptible to these conditions than the European bees because of their morphological characteristics.

Beekeeping is an agro based seasonal activity. It is currently one of the most widespread agricultural allied activities carried out throughout the world. Apiculture and agriculture are interdependent and thus cannot run in isolation as both have mutual benefits from each other. Honey bee pollination services have been reported to increase the yields and quality of many important cultivated crops, owing to which beekeeping has emerged as an important component for sustainable development of agriculture and horticulture. Total area of bee dependent crops in India is around 55 million hectares and 200 million colonies are needed to meet this, while at present only 1.8 million colonies are present (**NBB 2017**). Hence there is huge potential for the beekeeping in India. It is an important means of economic development in rural areas, since it provides employment, income generation, ecological balance and human nutrition.

Honey production is the major aim of beekeeping industry. Honey is the most important primary product both from the quantitative and economic point of view and has been used by mankind for many years as a source of food, medicine and for cultural ceremonies (**Cartland, 1970; Mcinerney, 1990 & Molan 1999**). It is sweet substance produced by the bees from the sugary floral nectar of plant through regurgitation, enzymatic activity, and water evaporation. Bees store honey in wax structure called honey combs. Its quality, taste, colour, aroma and viscosity depend on the type of plants and fruits the bees visited. Bees produce honey as storage food to be utized during dearth period when flowers are not blooming and therefore little or no nectar is available to them. Honey production and its uses have a long and varied history as its virtue is from ancient time. It is composed of sugars, minerals and vitamins B_1, B_2, B_3, B_6, B_5 and C. The average pH of honey is 3.9. Honey was the first sweet food tasted by the ancient Indian civilizations inhabiting rock

shelters and forests. It signifies as balanced nutrition food having high medicinal value with recognition of its medicinal properties to be used as sweet base for a number of medicines and it is also good for allergies, skin and sore throat. Now a days, it has become important food of modern civilizations taking into trend in food consumption. Doctors also give brief about the precise effect of antibacterial and antiseptic qualities of honey on human health. Thus honey is a precious natural health product being produced throughout the world.

Originally honey bees were mainly reared in traditional nets, bamboo holes, crevices of walls, wooden log, forest trees etc. and honey was extracted through crude method of squeezing the combs which resulted into destruction of bee colonies and deterioration of the quality of honey produced. These practices have been replaced by the modern beekeeping practices introduced from western countries in which bees are reared in movable frame bee hives (**Langstroth, Newton, and Bis**) of wooden boxes. Besides the hives, the beekeepers need equipments and implements like the hive stand, nucleus box and smoker. The industry also needs equipments and machinery for handling and processing of honey, bees wax, for manufacture of comb foundation sheets, and for other operations. Modern beekeeping is based on heavy use of equipments and honey processing plants which results in higher efficiency and also ensures the quality of produced honey.

Seasonal management of bee colonies varies in different parts of the country although the basic management methods are the same. Flow management, dearth management, provision of feeding, control and cure of bee disorders, bee diseases, pests and enemies are some of the routine measures to keep bee colonies healthy and strong. There are special management techniques like queen rearing, migration for honey production or for colony multiplication. Now a days beekeepers are getting attracted towards modern beekeeping technique as it is easily manageable, convenient and organized way of honey production.

Post-Independence there were very few beekeeping units in the country. Khadi Village Industries Commission (**KVIC**)/ board (**KVIB**) after its formation in 1954 hastened the beekeeping practices in rural areas. Through coordinated efforts of well-knit organizations like KVIC, beekeeper's associations and cooperatives, Government institution etc. beekeeping industry came on the map of village industries of India within two decades. The government of India has been making serious efforts in this regard as reflected from the launch of Central Sponsored Scheme during VIII five year plan

followed by formulation of National bee board in the year 2000. Beekeeping being included as an activity under National horticulture mission (NHM) in 2005. In the present scenario National bee board under Mission for Integrated Development of Horticulture, Khadi Village Industries Commission/ board, Ministry of Micro, Small and Enterprises and Rajkiya Moan Palan Kendra play an important role in overall development of beekeeping by promoting scientific beekeeping practices in the country. The several trainings, schemes and assistance programmes are launched to increase crop productivity through pollination support, honey production and value addition to bee hive products for increasing the income of the farmers/beekeepers in the rural areas of the country.

India has vast potential for beekeeping due to diversity in availability of flora and fauna. At current time India ranks first in terms of number of beehive stocks followed by China in the World. The average annual production of honey worldwide was about 1.8 million MT during 2016-17. There are 15 countries in the world which account for 90 per cent of the world honey production and export led by China, producing nearly 7 lakh MT and has 12.3 per cent shares in total world export during 2016-17 **(Ministry of Agriculture, China).** European Union is the largest importer of honey followed by North America. During the year 2016-17, India has produced a total of 95,000 MT of honey, out of which 45537.99 MT of natural honey was exported to other countries of the world and earned a foreign exchange of US$ 84.23 million (**India Stat, 2018**). The major export destinations of honey export for India are Bangladesh, United States of America, United Arab Emirates, Morocco and Saudi Arabia. Of the total production of honey in India about 61 percent was contributed by four States viz. West Bengal, Uttar Pradesh, Punjab and Bihar **(NBB, 2016).** The per capita consumption of honey in India during 2015-16 was only 38 grams as compared to 1800 grams in Germany during similar year.

In Uttarakhand, beekeeping forms an integral part of small holder farming system and plays a significant role as source of additional cash income in subsistence farming. The credit for popularizing beehives and modern beekeeping in Kumaon and other parts of Northern India goes to Mr. R.N. Mutoo as he established bee Centre at Jeolikote, Nainital. The central Government has taken certain positive initiatives and launched National Mission for overall development of beekeeping in North Eastern and Hilly State of the country (HMNEHS). Thus, there is a wide scope for beekeeping as a remunerative enterprise in Uttarakhand. Total number of beekeeping units in India is about 2.5 Lakh out of which only about 8,700 units are in Uttarakhand (3.48 per cent) producing 2500 MT of honey in 2016-17. Nainital, Haridwar, Pauri and Pithoragarh are the important honey producing districts in Uttarakhand.

Problem Statement

India is an agriculture dominated country as 68.84 percent of India's population is rural and most of the land holdings are small and fragmented. Indian agriculture is essentially monsoon and market-dependent and suffers from frequent distress posing threats to the welfare of farmers as well as their interest in farming. Declining farm size and income has serious implications on rural prosperity and overall economy. Hence increasing the farm income has become a priority for the state and planners. Government of India has proposed to double the farmers' income by addressing agrarian distress and crisis. In this context, beekeeping can act as a cornerstone in increasing income of the rural people, as it has not only vast potential to supplement income and employment generation, but also has potential to improve nutritional intake of rural population. Experiences show that sole cereal based cropping system is no more self-sustaining and remunerative, because production from certain piece of land has limits and it also leads to several ecological problems. In view of these facts farmers have to focus on agriculture allied activities to generate additional income for improving their livelihood. Further, it is being increasingly realized that unlike other subsidiary enterprises such as poultry, piggery and fisheries which require sizeable cost of establishment, beekeeping is less expensive and can provide more output with less input and maintenance cost (being self-perpetuating) which can be further reduced by better management practices. However, no proper records are available on its cost and return and therefore acquaintance with the magnitudes of cost and receivable returns based on modern management practices such as migration of hives, feeding bees on sugar syrup during distress period etc. will help beekeepers, planners and policy makers to make suitable decisions for the development of beekeeping enterprise.

The state of Uttarakhand blessed with 64 percent of forest cover, has huge potential for beekeeping because of its endowment with diversity in climate and vegetation. Though beekeeping is traditional activity particularly in Kumaon hills of the state and considered as the supplementary activity, but its potential as a source of income has been under-utilized and practically remained untapped in the State. The actual honey production in Uttarakhand has been far below than its potential to produce honey. There are several factors such as number of beehives per apiary, experience of beekeeper, forest land use right, price of honey, availability of market, labour and many other socio-economic factors which affect the honey production. In addition to this unorganized market structure also aggravates the problem of beekeepers and most of the honey output is sold in raw form to the agents at throw away prices. The value addition to the product is very low due to non-

availability of needed facilities and credit supply especially for processing and packaging. Although beekeeping has made some dents in few pockets of Uttarakhand, but large scale adoption is still handicapped due to short span of available bee flora which leads to migration. Cumbersome procedure to get permission for the forest land use, long dearth period due to climatic conditions and reduction in area of floral crops are other factors which cause hindrance in adoption of beekeeping as a remunerative enterprise. It has been also reported that lack of management and technological development, marketing of honey, absence of support price for honey, diseases and limited credit supply are some of the challenges that limit the honey industry in the state. In the light of the facts mentioned above the present study was conducted in Nainital district of Uttarakhand to investigate various issues involved in the production and marketing of honey with following specific objectives.

1. To assess the socio-economic characteristics of honey producers along with ongoing beekeeping practices;
2. To work out the costs of and returns from honey production;
3. To identify and to analyze the factors affecting honey production;
4. To examine the disposal pattern of honey output; and
5. To enumerate the major constraints faced by the beekeepers in production and marketing of honey.

Scope of the study

The findings of the study would explore the fact about production and marketing of honey in Nainital district. Very few researchers have attempted to study the economics of beekeeping in Uttarakhand state. The study is also expected to provide required information about proper utilization of input and other resources. Further, the information on the cost structure will be of high utility to financing institutions to fix the scale of finance. Though the finding of the study may not be conclusive but information generated in the study may be beneficial for the planners and administrators who are engaged in rural development activities.

Limitations of the study

The study has been conducted with well-planned research methodology but like other studies, this investigation also suffers from certain limitations. The methodology adopted for the present study has its own limitations due to lack of time, money and other resources on the part of the student invigilator. The limitations are listed below.

1. The study was conducted in Nainital district; only two out of eight blocks of the district are selected for sampling: hence the extent of generalization has to be cautiously made as agro-socio-ecological conditions vary over time and space. The data collected pertained to a particular climatic region and a single year. It does not reflect the other regions and time periods.

2. Most of the beekeepers were not maintaining systematic records of the costs and returns and were hesitant to give the correct information. The information obtained by survey method and presented in the study is based on the recall memory of sampled producers, which have certain limitations. However, efforts were made to minimize them through cross checks at the time of data collection.

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Review of Literature

Chapter 2 REVIEW OF LITERATURE

This chapter is devoted to the review of studies related to the economics of production and marketing of honey. In order to have a clear and in-depth understanding of the research investigation to be carried out. In view to choose the suitable analytical technique, work done by the various researchers in India and abroad pertinent to the present study has been reviewed. To facilitate systematic presentation of the literature, studies have been reviewed in five different sections. First section deals with the studies on socio economic characteristics and ongoing beekeeping practices of beekeepers. Second section deals with the studies done on cost of and returns from honey production. Third section is concerned with the studies related to factors effecting honey production. Fourth section covers the earlier studies on disposal pattern of honey. The constraints related to production and marketing of honey are dealt with in last section.

2.1 Studies related to socio economic characteristics of beekeepers

Cardiff (2006) conducted a study and presented an overview of Croatian beekeeper status in the market and their interest in pursuing cooperative business that has potential to achieve dynamic position in the market. Information was given on (1) the beekeeper attitude regarding current and future apiculture business in Croatia in the aspects of size, production technology, distribution and type of products, (2) the source of information and knowledge regarding cooperative business (3) the beekeepers willingness for membership in the cooperative and prospect of successfully organizing a beekeeper marketing cooperative in Croatia, (4) the Croatian beekeepers' cooperative marketing practices.

Khan *et al.* (2007) studied the beekeeping activities in Kumaon region of Uttarakhand and found that a significant growth in number of beekeepers (46 per cent) occurred during the short span of five years. Majority of beekeepers (94 per cent) were educated, out of which 15.4 per cent had educated upto post graduates. Around 45 per cent of beekeepers were young and had age between 20 to 30 years. The study also revealed that a sizeable number of beekeepers (40 per cent) were either land less or owned less than one acre of land.

Rivera *et al.* (2007) examined the social and technological aspects of honey bee production in the terrace zones of Milpa at the south of Mexico City. Honey production was a complementary activity of the families, contributing 30-50 per cent in the total income. The different levels of education attain by honey producers consisted of primary and secondary (50 per cent), preparatory (30 per cent) and university education (20 per cent).

Chauhan (2007) conducted a study on the honey production practices for indigenous honey bees and policy options for their conservation in Himachal Pradesh. The results revealed that the population of wild honey bees has been reduced rapidly and the honey hunters were required to be trained in harvesting the colonies properly. It was also observed that the honey bee colonies might be auctioned for the honey harvest to the authorized honey hunters. Also in the forest policy of the government, plant species providing sufficient flora should be included in the afforestation programme.

Singh *et al.* (2011) worked on the socio-personal characteristics of beekeepers of Haryana. Study showed that about half of the beekeepers belonged to middle age group (36-50 years) followed by respondents who were under young age group (21-35 years) to the extent of one-third of total respondents implying that most of the candidates (80 per cent) were either young or of middle age group. Majority of the candidates fell into low or medium education category i.e. about 38 per cent had educated up to junior high school level and about 42 per cent were had intermediate, about 20 per cent were highly educated. Therefore continuous efforts were required to promote education in the rural places. It was found that 41 per cent of people had small land holdings and about 27 per cent people had medium size land holding and about 20 per cent of the people were landless. Only around 12 per cent of the people had large land holdings. It signifies that beekeeping enterprise can easily be adopted by small beekeepers in the area. This also signifies that 43 per cent people had medium socio-economic status and about 37 per cent were from low level of socio-economic status. The left 20 per cent of candidates were of high level socio-economic status. It showed that people that possessed medium level socio- economic status were quiet higher than any other category. Most of beekeepers had medium to low extension exposure.

Tiwari *et al*. (2011) conducted a study on status of beekeeping in Chamoli and Rudraprayag districts of Utarakhand and found that only small proportion; about 14 per cent of total families in the study area were engaged in traditional beekeeping as subsidiary enterprises with agriculture. *Apis cerena* was a commonly reared bee species by beekeepers in the area. Further the study revealed that most of the respondents nearly about 85 per cent learnt beekeeping from their parents, elders or from the neighbours, 10 per cent developed their own skills through experience, while 5 per cent gained it from trainings organized by different agencies. The education level of beekeepers ranged from primary to senior secondary. It was found that 72 per cent of

beekeepers had primary schooling and 20 per cent had secondary or senior secondary, only 2 per cent had higher education while 6 per cent were illiterate. There were 5 or more members in each family in the area. The total land holding size was up to 2 hectares or less per family and agriculture was the main occupation. As high as 47 percent of the beekeepers were of age above 50 years while 9 per cent were of 20-30 years. Nearly two-third of the total beekeepers in area was of age more than 40 years. The beekeepers had an average experience of 12 years in beekeeping.

Lal *et al.* (2012) studied the socio-economic characteristics of beekeepers and rural youth attended beekeeping training programme in Kullu and Manali districts of Himachal Pradesh and found that majority of the respondents (70.70 per cent) including both male and female belonged to the age group of below 35 years. Least number of respondents, that is only 4.20 per cent consisted only male participants above age group of 50 years. Educational level of respondents showed that majority of respondents were educated upto secondary (53.30 per cent) followed by those educated up to senior secondary (21.80 per cent) and primary education (19.10 per cent). Only 1.30 per cent of respondents were graduated.

Kumar (2013) conducted a study about the production and management system of apiculture in four districts of Jammu region and results of the study revealed that the average age of the beekeepers was 37.39 years. Maximum respondent-beekeepers were young and educated from middle pass to matriculate, and maximum beekeepers (68.57 per cent) had marginal land holding and only 16.67 per cent respondents had small land holding in all the four districts. Beekeeping was the main occupation of the respondents and none of the beekeepers were involved in private employment. Overall, in all the four districts 4.28 per cent beekeepers were member of at least one organization. The beekeepers experience to practicing beekeeping ranged from 1 to 43 years and overall average experience in beekeeping was 7.91 years. At aggregate level, average size of family was 6.20 members. Overall (60 per cent) of beekeepers had 5-56 numbers of boxes, followed by 29.52 per cent having 57-120 number of boxes and 10.48 per cent having 121-800 number of boxes. Thus in the four districts average number of boxes was 72.31 per beekeeper. About 66 per cent of beekeepers were trained by fellow beekeepers followed by 57.61 per cent trained by state Agriculture Department. Further it was observed that all respondent-beekeepers were in contact of extension workers of four districts whereas only 3.33 per cent of beekeepers utilized banking services.

Gupta *et al*. (2015) conducted a comparative study on beekeeping in Haryana and Uttar Pradesh and selected 35 beekeepers both from Haryana and Uttar Pradesh. The results revealed that beekeeping was a male centric job in both of the state. The age-wise distribution pattern showed that majority of respondents 65.71 per cent in Uttar Pradesh and 77.14 per cent in Haryana belonged to the age group of 20-40 years. In Uttar Pradesh (48.57 per cent) and in Haryana (51.43 per cent) beekeepers had 5-6 members in their family. The awareness about beekeeping related agencies and government support through subsidies was more in Uttar Pradesh in comparison to Haryana.

Sharma *et al.* (2016) investigated about the socio-economic characteristics of trainee participating in training on beekeeping enterprises. The main reason for respondents attraction towards beekeeping enterprise was low capital investment and quick and high returns. Since 2006, more than one hundred rural youths had been trained in bee-keeping enterprise through seven vocational training courses conducted by KVK, Muktsar. Out of total 120 trainees, 28 trainees were continuing the bee-keeping enterprise with great success. Further an investigation was done to study about the socio-economic characteristics of these 28 bee-keepers. Findings of the study revealed that bee-keepers 21.43 per cent were of the age group of 26-42 years, 67.8 per cent beekeepers were of age group 21-25 years and rest were under age group of 36 to 50 years considered as young and middle respectively. Majority of them (35.7 per cent) were having education up to intermediate followed by matriculation (32.1 per cent). Four bee-keepers (14.3 per cent) were landless, more than half (53.6 per cent) of these beekeepers had small and marginal land holdings and nine (32.1 per cent) were medium land holdings. It was found that 16 beekeepers (57.1 per cent) were having small scale enterprise (10-50 colonies), while five (17.9 per cent) were having medium scale enterprise (51-100 colonies) and 7 (25.0 per cent) were having large scale enterprise (>100 colonies). The average income range in small scale enterprise varied from 0.20 to 1.28 lakh and in medium scale enterprise, average income varied between 1.30 to 1.92 lakh. It was found that seven beekeepers were having more than hundred bee colonies (up to 350 bee colonies) and their average income varied from 1.95 to 6.20 lakh per annum. The beekeepers were earning money from the sale of honey, bee colonies and bee wax. Only 5 beekeepers pursued beekeeping as a main occupation and 75 per cent had farming as their main occupation.

Otim *et al*. (2018) studied about the socio economic characteristics of beekeepers in five district of Uganda. Results of analysis showed that overall 80.3 per cent of the

beekeepers were men and 19.7 per cent women. About 61 per cent of the sampled beekeepers were over 40 years of age. Majority of the sampled beekeepers (57.9 per cent) kept two or more types of bee hives, 27.3 per cent of the beekeepers had only traditional bee hives, 11.1 per cent of the beekeepers had only top bar hives while 3.2 per cent kept only Langstroth bee hives. Approximately 65 per cent of the beekeepers owned between 1-20 bee hives and about 83 per cent of the hives were colonized. The demographics on the education level indicated that only 1.4 per cent of the beekeepers had not undergone any formal education while 79.7 per cent of the beekeepers had undergone trainings on aspects of honey production. As high as 52.5 per cent of the beekeepers had a beekeeping experience of 1-5 years, while 19.6 per cent had an experience of more than 10 years. It was found that 64.7 per cent of the beekeepers had available markets for their honey, while 11.6 per cent of the beekeepers did not know where to find markets. The ranking of beekeeping as an income generating activity was first in 15.3 per cent of the beekeepers.

2.2 Studies related to costs and returns in honey production

Singh (1983) examined economic and financial feasibility of beekeeping in Nainital district, then in U.P. The economic feasibility was analyzed by computing B.C. ratio and the financial feasibility was judged on the basis of consistency of the return schedule of the enterprises with that of repayment schedule fixed by the bank for the enterprise. The study revealed that beekeeping was economically profitable but not financially feasible in the district.

Sharma and Bhatia (2001) conducted a study to analyze the economics of stationary and migratory beekeeping in Himachal Pradesh. In results, it was found that average number of colonies in case of migratory and stationary beekeepers was 56 and 23, respectively. Fixed cost for the migratory and stationary beekeepers was Rs. 63.13 and Rs. 59.10 per colony and the variable cost was Rs. 195.15 and Rs. 167.83 per colony respectively. Total cost for both type of beekeeping was Rs. 258.28 and Rs. 226.93 per colony, respectively. Average honey produced was 41.60 kg per colony in case of migratory and 15.66 kg per colony in case of stationary beekeeping. Net returns for migratory colony were Rs. 1413.72 per colony and Rs. 353.07 per colony from stationary. This shows that the difference in cost structure for honey production per colony of both practices was small but the yield from migratory beekeeping was higher than the stationary, as migration of bees increases the frequency of honey harvest. So due to higher yield, net returns were almost three times higher in case of migratory beekeeping.

Chauhan (2002) conducted a study on honey production in Himachal Pradesh and examined its production, trends and other economic aspects. Himachal Pradesh witnessed an overall growth rate of 31.19 per cent per annum in honey production from 1981-82 to 1997-98. Honey production on government farms showed a declining trend, where as it increased on private beekeepers' farms. Investment on beekeeping with 50 colonies during 1998-99 was Rs. 72,226 and Rs. 77,026 under stationary and migratory conditions, respectively. Net returns per colony were Rs. 475 and Rs. 1148 under stationary and migratory conditions. Cost of production per kg was higher under former (Rs. 43.56 per kg) than latter (Rs. 33.43 per kg) case. Input–output ratios were 1:1.68 in case of stationary and 1:1.19 in case of migratory bee farms. Break-even analysis indicated that more number of colonies under stationary beekeeping (23) than under migratory beekeeping (12) provide break-even output of honey which is just sufficient to compensate at no profit no loss basis.

Devkota (2006) conducted a study on economics of beekeeping in Nepal by taking into account 18 beekeepers. Main focus was on finding the benefit-cost ratio. It was calculated by including and excluding sale of colonies as 61.11 per cent of beekeepers also sold their bee colonies. Benefit–cost ratio was 2:41 and 1:58 in case of inclusion and exclusion of the income from sale of colonies. It showed that 88.88 per cent beekeepers were in profit, average annual income was Rs. 70758.33 per farm and average annual income per colony was Rs. 3317.31 in former case. In latter case, 77.77 per cent beekeepers were in profit, average income per colony was Rs. 49588.31 per farm and average income per colony was Rs. 1777.65.

Attri *et al.* (2010) conducted a study on beekeeping and its economic viability in Chamba district of Himachal Pradesh and observed that the cost incurred to maintained bee colonies in traditional beekeeping practice with *Apis cerana* was only Rs. 119.70 while for the modern beekeeping with European bee was Rs. 6735.50. While cost of per kg production of honey was Rs. 36.99 for modern whereas for old practices was only Rs. 1.71. Income generation from modern practices is much higher than the traditional while the ratio of profit to total production cost was higher in traditional one. The income to cost ratio was 48.65 in the old and 1.66 in the modern system. The annual yield for each hive of *Apis mellifera* and *Apis cerana* was 18 kg and 6.89 kg, respectively. Rearing Apis *cerana* was more adopt for subsistence beekeeping in marginal areas, whereas rearing *Apis mellifera* was more suited.

Kaura (2011) conducted a study to estimate the profitability index of apiculture enterprise in Pathankot and Gurdaspur district of Punjab. Data was collected by interviewing randomly selected 10 beekeepers from the study area. Profitability Index of apiculture was computed by including and excluding the revenue obtained from colony selling. The fixed cost for one colony per year was observed to be Rs. 310.45. Bee colony and beehives together accounted for highest share in fixed cost (91.4 per cent). Variable cost incurred per colony was estimated to be Rs. 853.78. Labor, supplement feeding, comb foundation and migration cost contributed 42.8 per cent, 26.1 per cent, 20.3 per cent and 9 per cent to the variable cost, respectively. Highest (65.4 per cent) return was realized by sale of honey followed by 33.16 per cent from sale of bee colonies. The net income from each colony was Rs. 2123.49 (including the sale of bee colonies). The study revealed that profitability indices of apiculture were 2.81 and 1.88, respectively in case of inclusion and exclusion of the income received from colony selling. It showed that apiculture industry was running in profit in both cases.

Malhotra (2014) conducted a study on production and marketing of honey in Samastipur district of Bihar and observed that total cost, gross income, net income and honey production per bee colony increased with increasing size of apiary. The cost of production per kg of honey was found to be 34.88, 26.19, 31.92 and 38.54 rupees in case of stationary beekeepers (small apiary), migratory beekeepers (small apiary), medium beekeepers and large beekeepers categories, respectively. Total cost, gross income, net income and honey production per bee colony was found to be higher in case of migratory beekeeping i.e. Rs. 905.71, Rs. 5850.88, Rs. 4945.17 and 34.71 kg, respectively. On the contrary, cost of production was higher (Rs. 34.88/kg) in stationary beekeeping. The analysis indicated that migratory beekeeping was more efficient than stationary beekeeping. B-C ratio was higher for large size apiary and migratory mode of beekeeping i.e. 5.50 and 6.46, respectively.

Poornima (2014) conducted a study related to social and economic auditing of beekeeping in Uttara Kannada and observed that beekeeping had a potential for becoming a respectable and subsistence business, which can generate good amount of surplus income to people living in villages. It is a good family business in both small level and large level. It was suggested that there is an immediate requirement for augmentation and development of both subsidies as well as loan services to make beekeeping more widespread and remunerative. There is a huge scope for augmenting income with the usage of value addition techniques in bee products.

Sharma *et al*. (2016) conducted a study in Sri Muktsar Sahib district of Punjab to reveal the performance of migratory beekeeping units. A total of 45 beekeepers were taken to accomplish the objective of the study. The investigation of the personal attributes of the candidates pointed out that migratory units of bees were adopted by non-employed rural youngsters from different sections of the society. The people of this district used to migrate their bee colonies to districts of Haryana and Punjab when there was a dearth period and scarcity of flora in the local area. The beekeepers were categorized in to three group based on the migratory route followed by them. The average number of harvests varied from 8.5-11.0 each year with a honey production of about 29-45 kg per hive at aggregate level. It was higher for those candidates who migrated to Kota district of Rajasthan in winter season. The beekeepers who followed migratory route to Ganga Nagar district produced honey about 35/kg with the average of 9 harvests per year. The results revealed that cost of honey production was Rs. 2542.6 per box in Group I, Rs. 3328.5 per box in Group II and Rs. 2406.4 per box in Group III. The honey sale price varied negligibly from Rs. 135.6 to 140.6 for three different groups. The income from sale of honey and additional income from sale of new colonies and other bee products was also maximum (Rs. 868.3) in Group II and minimum in Group III (Rs. 735.9). Benefit-cost ratio was highest in Group II (2.23:1), followed by Group I (2.15:1) and Group II (2:1)

Sain and Nain (2017) examined the cost of and return from honey production in an apiary of 80 boxes and revealed that the costs of fixed assets was Rs. 2,15,900 and variable cost incurred was Rs. 1,49,500. The returns received from the sale of honey and by products was Rs. 3,17,000. The Net profit over variable cost was Rs. 1,67,000 in one year. The fixed assets cost can be recovered within the two years of establishment of apiary unit.

2.3 Studies related to factors affecting honey output

Anonymous (2001) investigated that the access to credit was necessary in financing honey production, marketing and farm investment. The water was an essential component that signified the importance of location in determination of the honey output.

Gangwar (2005) conducted a study on economics of beekeeping in Nainital district of Uttarakhand indicated that an increase in the number of beehives by one unit caused an increase in honey output by 1.137 and 1.811 per cent, respectively in Bhimtal and Haldwani blocks of Uttarakhand. Human labour was found to be negatively non-significant indicating excessive use of this resource.

Chittaranjan *et al.* (2006) examined the relationship of socio-economic characteristics of beekeepers with their level of knowledge about scientific beekeeping. Information was collected from 100 participants of training programmes in Assam Agricultural University during 1996-2000. The results showed that the family size and age had significant and positive relationship (at 5 per cent) with certain level of knowledge on recommended practices of scientific beekeeping.

Olarinde *et al.* (2008) studied different determinants as well as technical efficiencies of beekeeping; he used a special function known as stochastic production frontier function, and his study was conducted in Northern Oyo state and in the district of Oke-ogun, Nigeria. In all, 60 candidates were selected and primary data was gathered by multilayered data collection techniques. The data included different variables i.e age, sex, labour, marital status, occupation and baiting materials etc. Conclusion of the report demonstrated that the average technical efficiency of farms was 0.854 and it was found that the most important characteristics that determine beekeeping efficiency were marital status and occupation of respondent.

Vural and Karaman (2011) observed the socio-economic perspective of beekeeping and the correlation of different types of beekeeping hives and honey production. Turkey has a vast scope in beekeeping with magnificent bee flora, suitable ecology and existence of different bee colonies naturally. Turkey was counted as one of the most important countries that produce honey in large scale. Still turkey had not realized its full potential in this sector. In Turkey, many agriculture organizations are indulged in apiculture but only a few have apiculture as the main source of income. According to the econometric analysis results it was found that, taking all other variables constant, 1 per cent increment in old type of hives were responsible for a decline of 0.29 per cent in honey production and 1 per cent increment in new type hives led to a 0.47 per cent increment in honey production. But apart from the hive type there are other factors that also regulate honey production. For instance, though Turkey is a leading country in honey production in the world, but still it does not possess proper market structure for world export. The main reason behind such a lag is that beekeeping is not considered as a commercial activity. Honey producers due to lack awareness do not produce honey according to economic conventions. This is the reason why the quality of honey suffers a strong setback in domestic market. It should be under consideration that in apiculture colony size is less important than efficiency per hive.

Dinka and Kumsa (2015) conducted a study in Ambo District of Ethiopia about factors affecting honey production and revealed the fact that education and price of honey were the significant factors that enhance the productivity level of honey production while the size and number of hives, farm size, household labourer and beekeeping experience which were used as important inputs to determine the quantity of honey output. Education level and distance to market had negative relation with honey output. There was no association between family size and honey production

Mesakkimuthu (2015) conducted a study on factors influencing entrepreneurial potential of beekeepers in Tamil Nadu. It was observed that there was non-significant positive relationship between age and entrepreneurial potential of beekeepers. Relationship for the extension agency contact was positively significant with entrepreneurial potential of beekeepers. Results also indicated that there was a significant negative relationship of educational status, family size, annual income, mass media exposure; extension participation, credit orientations and training attended with the entrepreneurial potential of beekeepers. In addition to that a look at the results revealed that there was significant negative relationship between size of land holding and entrepreneurial potential of the beekeepers.

Peter (2015) studied about the factors influencing honey production in Eastern Cape Province of South Africa and found that although there was a need for colonies to produce honey as the results were significant, the highest number of bee colonies does not mean highest honey production. Other variables that were found to have a significant impact on honey production were gender of the beekeeper, access to credit, availability of labour, price of honey and the distance to market. Household income, education level, access to extension services, number of beehives and market access had no significant impact on honey production. It was noted that if selected beekeepers were not subsidized, the profit margins could be very low. The results revealed that, 88.4 per cent of the variation in honey production was explained by six significant variables in the model, while 11.6 per cent was due to error. Results revealed that honey production was significantly determined by gender, colony size, access to credit, labour availability, price of honey, and distance to the nearest market ($P < 0.05$).

Otim *et al.* (2018) studied about the influence of socio economic characters on honey production in Uganda. In his findings, it was observed that out of the twelve explanatory variables, only four variables significantly influence honey production with

P-values of < 0.05. These four variables were, ranking beekeeping in income generation, types of hives, total number of hives owned by beekeepers and number of hives colonized. The results depicts that honey production was positively affected by share of income from beekeeping in beekeepers' income generating activities. It was important to note that honey production was high among beekeepers keeping only traditional hives and those who kept more than one hive type as compared to modern bee hives. The production of honey increased with increasing number of hives owned and colonized per beekeeper up to 80 bee hives above which the production decreased. The rest eight variables that have not significant effect on honey production were gender, age, education level, beekeeping experience, market availability, training in aspects of honey production and keeping records of the beekeeping enterprise.

2.4 Studies related to marketing pattern of honey

Chauhan and Sharma (1998) examined the honey market in Himachal Pradesh and observed that the marketing channel comprised of Beekeeper → Wholesaler → Retailer → Consumer was the main channel for sale of honey on stationary and migratory bee apiary in the study area as 57 to 74 per cent of the beekeepers disposed off, higher share of about 58 to 78 per cent of their total honey produce through this channel. The producer's share in the consumer's rupee was as high as 61.70 per cent in above mentioned channel on stationary farms and 56.86 per cent on migratory farms.

Chauhan and Sharma (2004) studied the characteristics of beekeeping vis-à-vis production and disposal pattern of honey under different system of beekeeping in Himachal Pradesh. The marketing channels, costs and margins in the marketing of honey were also studied by them. The study concluded that the beekeeper processor or packers wholesaler-retailer consumer was the most patronized marketing channel of honey in the study area as 41.5 per cent beekeepers disposed off 76.05 per cent of the produce through this route. The marketing costs and margins were assessed high at 22 per cent and 51 per cent, respectively thus lowering producer's share to 27 per cent in consumer's rupee of Rs. 140 per kg. The study further observed that consumer's price varied from Rs. 70 to Rs. 125 per kg for raw honey and Rs. 130 to Rs. 166 per kg for processed honey, respectively. The policy implication of the study suggested that the honey must be packed in well-sealed, air tight clean wide mouthed glass bottles so that a teaspoon could enter freely while taking it out for consumption purpose which indirectly might help in getting remunerative price for the natural product. Efforts should also be made to reduce the marketing costs in general

and the marketing margins in particular so that producer's share in the consumer's rupee would be raised to a reasonable level as in the case of other perishable commodities.

Saner *et al.* (2004) conducted a study about economic analysis of beekeeping in Turkey and revealed that 70.77 per cent of beekeepers sold honey to dealers at farm gate, 10.77 per cent of beekeepers took it to local market (Izmir and Mugla) for retail sale directly to consumers while 9.23 per cent of beekeepers sold honey to beekeeping cooperative and 9.23 per cent of them sold it to exporter firm. They observed that beekeepers had packaged honey into glass jars (1-1.5 kg) or tins (27-28 kg) and they didn't had any label for sales.

Gangwar (2005) in a study on economics of beekeeping found that there were two marketing channels of honey prevailing in the Nainital district viz. producer to consumer and producer to agent then to consumer. The percentage share of total output sold to agents were 79.6 and 75.8 in Haldwani block and Nainital block, rest was sold to consumer directly. The quantities demanded and prices offered were observed to vary from months to months. The producer of both the block tried to dispose off their produce as soon as possible. The price received per kg of in Haldwani block was minimum of Rs. 62 in the month of December and maximum of Rs. 82 in the month of March. There was absence of competition between buyers due to limited numbers of buyers prevailing in the market.

Singh and Sharma (2007) conducted a study on economics and marketing strategies of successful beekeepers in Ludhiana district. Highest share of variable cost was incurred on packing material for honey (21.72 per cent). The gross margins over variable costs were highest (Rs. 39.39 per kg) and share of producer in consumer's rupee was 92.69 per cent when the honey was sold directly to the consumer, as there was no intermediary in between the producer and the consumer. The study found that there was a lot of possibility for Punjab to increase its export share, if more people invest in bee colonies. There was lack of regulated market and thus marketing of honey was a big problem on the sampled farms. The beekeepers suggested for fixation of proper price of honey by the government. It was found that consumers were not aware of use of honey as food and in cosmetics. Most of the beekeepers kept bees only to produce honey and bee wax. However, apart from honey and beewax, a bee provides pollen, propolis, royal jelly, venom, etc. The study suggested for creating awareness about beekeeping among people. Some beekeepers also faced the problem of freezing of honey in winters due to crystallization of honey at low temperature, the consumers doubted about its quality.

Singh (2008) investigated the present scenario and future prospects of marketing and value addition of Indian honey in national as well as in international markets and suggested that significant and joint effort was required at every level to promote beekeeping in India as beekeeping had proved itself as an tremendous commercial activity for soothing the socio-economic status of small as well as marginal beekeepers and landless sections of our society

Kumar *et al.* (2012) studied about the marketing pattern of honey in Haryana and found that the marketing of honey was done mainly by two channels: (1) Producer-Consumer (sale at apiary site) and (2) Producer-Wholesaler-Retailer-Consumer. It was Further observed that the net share of producer in price paid by the consumer was 54.52 per cent in Production-Wholesaler-Retailer-Consumer channel.

Okonta (2012) examined the marketing of products made by honey bees in Oshimili located in North Local Area in Delta state. It was observed that very little attention was given to marketing of bee products as compared to the production of bee products. To know about the marketing channels of bee products in the study area, four villages in Oshimili were selected at random and a well-structured questionnaire was developed for getting information from 119 respondents, the marketing channel that was going on was: producer-consumers, producer –wholesaler-consumers and producer- retailer-consumers. It was found that there was no major difference in the need for bee products based on age, educational and employment of consumer. It was advised that infrastructures should be developed and financial assistance should be imparted to candidates. It was concluded that bee products should be produced massively since the industrial requirement is also high.

Malhotra (2014) studied about the disposal pattern of honey in Samastipur region of Bihar and observed that channel I (i.e. Producer → Trader → Processor → Retailer → Consumer) was mainly followed marketing channel for marketing of honey in the study area as majority (68.33 per cent) of the beekeepers followed this channel for disposal of honey. A little more than one-fourth (27.31 per cent) of total marketable quantity of honey was sold through this channel. Though the proportion of beekeepers opting for this channel for marketing of their produce (honey) was larger but the quantity of honey marketed through this channel was lower because most of the beekeepers (35 out of 40 i.e. 87.50 per cent) who adopted this channel, were small beekeepers owning smaller number of colonies and consequently producing less amount of honey. It was further observed that the quantity of honey marketed through channel II (i.e. Producer → Processor → Retailer → Consumer) was

62020 kg which accounted for 72.69 per cent of total quantity of honey sold. Larger quantity of marketable honey (72.69 per cent) was marketed through this channel because cent per cent of large beekeepers and majority of medium beekeepers (53.85 per cent) adopted this channel for marketing their produce.

Singh and Sekhon (2014) studied about marketing pattern and efficiency of honey production in Punjab. The findings showed that supply chain of medium beekeepers mostly included a middle men or commission agent. It was also recorded that the person who enjoys the maximum profit of honey sale was commission agent rather than producer. Marketing efficiency was greater for (Producer → Consumer) supply chain but, maximum flow was observed through (Producer → Commission Agent → Processor) supply chain.

Yadeta (2015) conducted a study on honey production and marketing in Ethiopia and observed that only 10 per cent of the honey produced in country was utilized by the producer. Rest 90 per cent was used for sale and out of this it was estimated that 80 per cent honey was used for brewing of tej, Honey consumption in domestic market was increasing due to increased consumption of tej. In domestic market honey producers were the primary unit, who sold their fresh crude honey to collectors in the nearest town/village. The main work of a collector was to supply that crude honey to a wholesaler and some amount of honey to local tej brewers and other customers. The whole sellers situated mainly in cities, towns and their main work was to deliver the honey from collectors to retailers, brewers, processing units and consumers. In many areas it was found that, beekeepers established cooperatives to tackle the problems they face. The cooperative sell the semi processed honey collected from their members and then sends it to processing companies and other persons who buy honey in bulk.

Thakur *et al*. (2016) examined the scope of beekeeping in Satjalia Island within Indian Sunderban Delta. The results of study revealed that beekeepers were not able to sell their produce directly in the market and they require some middle agent for marketing their product. Some associations that beekeepers had were West Bengal Beekeepers Association, Baruipur Apiculture Industrial Cooperative Society, 24 Parganas Beekeepers Cooperative Society Ltd., Gramin Bharat Udyog and Herbal and Ma Mansa Enterprise, these association used to send their people to establish apiary boxes in Sunder Ban region but the point was that the amount that the beekeepers got from this symbiosis was very meagre. These agents bought honey from producers at the rate of Rs. 100 to 140 per Kg. A full season beekeeper could collect 70 Kg of honey and a seasonal one could collect 35 Kg. from each box under

favourable weather condition. Honey production in forest was more laborious and risky as compared to cultural one, but quality of forest honey was far better than cultural one.

Syngkon (2017) conducted a study about prospect of beekeeping in Khatarshong region of Meghalaya and results revealed that the beekeepers pack the honey in the tin containers (mustard oil) which capacity was around 23 kg. Sometime they filter the honey and keep it in the small bottle. Even though the beekeepers are hardworking, their income is less due to lack of proper marketing facilities and no proper means of transportation. The beekeepers had to carry the honey containers all by themselves. They had to go through the steep hills and slippery path to reach the nearby market. Further observed that the price of the honey bee varied from time to time; it was not stable or fixed. The middle men bought from the beekeepers at a low rate. The range of the honey price was from Rs. 120-220 per liter. The consumers soon purchased this honey at higher prices from the market (middle men). The middle men were playing an exploitive role in the marketing process. The middle man bought the honey from the beekeepers and sold it to traders in Shillong who were mainly the Marwari traders and these traders sold honey to retailers at the border market at a rate not less than Rs. 400/500 per liter. The wax collected after filtering the raw honey was sold at the rate of Rs. 200 per kg but the beekeepers largely wasted the wax due to lack of awareness of its market value.

2.5 Studies related to constraints faced by the beekeepers

Firdoos (2001) reported that lack of management and technology development for commercial beekeeping activities, quality issues, low price of honey and limited credit supply were the major challenges for growth of honey industry.

Kumar and Singh (2004) conducted a study on prospects of beekeeping in Ludhiana district of Punjab. It was observed that there was a good prospect of beekeeping in Punjab particularly in Ludhiana district. It was found that 73 per cent of the respondents wanted to increase the level of their business (numbers of colonies), 23 per cent wanted to decrease it and rest 4 per cent did not want any change in their level of business. There were some constraints like difficulties in getting credit, pesticidal hazards to bees, marketing of bee products. It was concluded that by getting rid of these constraints, a huge potential of beekeeping could be explored in the region.

Nair (2004) in the study revealed that beekeeping as an additional income generation industry was not effectively getting desired attention in Kerala in spite of the

favourable climatic conditions and endowment and diversity of vegetation. Moreover, utilization of less productive bee species, lack of attempts for stock improvement of honey bee species, problem of bee diseases, depleting floral resources and lack of cooperative migratory beekeeping were the major drawbacks for development of this industry in Kerala. Lack of scientific knowledge about the seasonal flowering and unawareness about potentiality of critical resources which these plants can offer, were the two major factors for non-exploitation of these resources for undertaking beekeeping activities in the .

Asrani *et al.* (2007) conducted a study on the prospects of beekeeping in the Haryana. In the study, 100 respondents were taken out of which 50 were untrained beekeepers with 25 women and 25 men in both the categories. Further, it was found that 52 per cent of total respondents were interested to undertake training and 44 per cent were interested to start beekeeping and the reasons were to earn extra income, personal interest, utilization of leisure time, good profitable business etc. Those who were not interested in beekeeping gave some reasons and these reasons were grouped into social, environmental, physical, economic, technical and marketing constraints. Social constraints were lack of family support, no interest in beekeeping and ignorance about benefits of honey. Environmental constraints were lack of available land, lack of flora and crop, management of bee colonies in extreme weather, and shortage of water. Physical constraints were fear of bee stings, skin irritation and allergies, eyes irritation. Economic constraints were; difficult loan procedure, lack of knowledge about facilities of loan for buying raw materials, and lack of subsidy. Technical constraints were lack of knowledge, fear of diseases and enemies, problem of migration of bee colonies, management of food for colonies in off season and poisoning of bees due to pesticides.

Pokhrel (2008) studied about the ecological problems faced by beekeepers reported that the attack of predators and parasites, diseases infestation, poisoning caused due to pesticidal spray on flora crops, and lack of bee forage as the main ecological problems of the hilly areas and deforestation (cutting of floral trees) and pesticidal poisoning were the key ecological problems in beekeeping reflected in *terai* region of district Chit wan of Nepal.

Belie (2009) made assessment of the constraints and opportunities in Burie district of Amhara region, Ethiopia. The lack of beekeeping equipment, chemical poisoning by pesticide and herbicide application, shortage of bee forage, and drought, knowledge and skill gap were observed as major constraints in beekeeping.

Monga and Manocha (2011) studied the constraints which resisted the adoption of beekeeping in Panchkula district (Haryana) and concluded that major problems faced by the beekeepers were infestation of honeybee pests and diseases, migration due to unavailability of bee forage round the year at particular place, lack of credit supply for establishing the venture and to compensate the losses caused due to pests infestation and occurrence of diseases in bee colony, difficulties in managing the bee hives in extreme climatic conditions, death of bees as a result of pesticide poisoning and non-availability of subsidiary occupation. They further reported that lack of government cooperatives in support of marketing of honey, lack of self-motivation, lack of skilled laborers and training institutions were other problems felt by few beekeepers.

Ramachandra *et al.* (2012) studied about the beekeepers of Uttara Kannada and enlisted major constraints of beekeeping as limited and minimal subsidy (17.34 per cent), tax on machinery i.e. on extractor and bee box (18.8 per cent), restriction on supply of colonies with boxes (15.6 per cent), sanctions in migration approval (15.49 per cent) and ranked them as these were the main financial as well as administrative limitations of beekeepers. Non-availability of advanced beekeeping technology for queen rearing and adding value to bee products was some other constraints (6.25 per cent).

Bansal *et al.* (2013) conducted a study about the constraints of apiculture in India and concluded that the beekeeping production was affected by indiscriminate use of pesticides, bee diseases and enemies, adverse effects of weather, low price of products, lack of extension contact, credit supply, insurance of bee colonies, high cost of equipments, lack of bee flora, adverse weather conditions, and difficulties during migration of colonies. It was found that the susceptibility of honey bees to different diseases, pesticide hazards and marketing of bee products were major limiting factors in the prospects of beekeeping. Majority of the beekeepers wanted to increase their level of business. Therefore, it was suggested that specialized training courses should be organized to overcome these problems and to promote their business.

Kumar (2013) examined the production and management system of apiculture in Jammu region and identified the constraints faced by sampled beekeepers, which were grouped as economic problems, technical problems, infrastructural and administrative constraints, socio-cultural problems and post-harvest constraints. Further the analysis revealed that, in general major constraints as perceived by the

beekeepers were: high cost of equipments, low selling price of honey, honey bee enemies, lack of government support, lack of effective policies by the government on beekeeping, problem from police at the check post during migration to other , lack of honey processing unit, problem of transport facility, public disputes arising due to bee sting, interference of neighbours etc.

Mesakkimuthu (2015) conducted a study about entrepreneurial potential of beekeepers in Tamil Nadu and observed that the most important constraints experienced by the beekeepers were the lack of technical-know how about disease management, absence of specific government schemes for beekeepers, absence of support minimum price for honey and honey based products, lack of access to organized market for honey and honey based products, absence of storage facilities at reasonable price. Other constraints comprised of damage to colonies due to pest infestation, absence of policy frame work, lack of financial support, non-availability of equipments, lack of group activity among the beneficiaries, high price fluctuation, lack of skill up-gradation, high cost of honey filtering equipments, unsuitable agro-climatic conditions and non-availability of good quality bee box.

Kumar *et al.* (2018) conducted a study on constraints in transfer of beekeeping technology in Bihar and 25 constraints were recorded by the respondent-beekeepers with varying degrees of seriousness. Out of these, as many as 11 constraints were detected to be "Very Serious" (Score > 48), 4 "Serious" (Score in between 44 to 48) and 10 "Not so Serious" (Score up to 43). The five most serious constraints were inadequate technical guidance and cooperation by line departments, lack of capital for establishing a beekeeping enterprise, non- availability of assured market facilities, lack of regular and skill related effective training, and lack of technical knowledge for efficient seasonal bee management. In addition to this, the constraints d by beekeepers were also grouped into five categories *viz.* technological, economic, transfer of technology, marketing and management. Results indicated that transfer of technology constraints (CIS-1.14) was perceived as the most serious and was accorded first rank followed by management constraints (CIS-1.12), technological constraints (CIS-1.11), economic constraints (CIS -1.09), and marketing constraints (CIS-1.03). Overall low price of honey, lack of genetically superior bee queen, lack of credit facility, non-availability of better inputs and regular technical guidance were the major constraints faced by the beekeepers in the region.

2.6 Summary comments on studies reviewed

The reviews cited in this chapter clearly indicate that there are only few recent studies that have been undertaken in the country related to economics of production and marketing of honey. In addition to this no separate work was done on factor influencing honey production. So the present study made an humble effort to look into the socioeconomic status of honey producers in Nainital district of Uttarakhand, costs of and returns from honey, factors affecting honey production, various production and marketing related aspects and constraints faced by beekeepers. From all the above reviews knowledge has been acquired in using various tools and techniques utilized and appropriate methodology for present study has been adopted.

Profile of the study Area

Chapter 3 PROFILE OF THE STUDY AREA

This chapter provides a general description of the study area where the present research has been conducted. Knowledge about the physical profile and natural characteristics of the study area is of great importance as it helps to understand the problem clearly and to draw inferences accordingly. The present study was conducted in Nainital district of Uttarakhand. This chapter has been divided into three sections. The first section 3.1 gives a brief description of geographical, demographic and agricultural features of the Uttarakhand. Section 3.2 describes the geographical, demographic and other important features of Nainital district. Section 3.3 deals with the information about Bhimtal and Ramnagar blocks of Nainital district in brief.

3.1 General features and geographical structure of Uttarakhnad

3.1.1 Geographical features

Uttarakhand is located at the foothills of the Himalayan mountain ranges. The state was carved out from northern Uttar Pradesh on 9th November 2000 as the 27th State of India. Uttarkhand is mainly a hilly state having international boundaries with China (Tibet) in the north and Nepal in the east. On its North-West lies the Himachal Pradesh, while on the South is Uttar Pradesh. It lies between 28˚43′ north latitudes to 81˚02′ east longitudes. Its geographical area includes both hill and plain area, with hills covering an area of about 46035 square kilometer and plains covering an area of 7448 square kilometers with a total of 53483 square kilometres (Table 3.1). The length and width of the state being 358 km and 322 km, respectively. It has a wide variety of geographical features ranging from snow-capped mountain peaks in the north to tropical forests in the south; its climate and vegetation varies accordingly.

Uttarakhand state has two major administrative units viz., Kumaon (South-East portion) and Garhwal (North-West portion) composed of a total of 13 districts (Table 3.1). Kumaon consists of 6 districts viz, Nainital, Bageshwar, Almora, Pithoragarh, Champawat and Udham Singh Nagar, while Garhwal consists of the remaining 7 districts of the state which include Dehradun, Haridwar, Pauri,Chamoli, Rudra Prayag, and Tehri.

Table 3.1: General features of Uttarakhand

S. No.	Particulars	Unit	Uttarakhand
1.	**Total geographical area**	Sq. Km	53483
2.	**Number of Divisions**	No.	2
3.	**Number of Districts**	No.	13
4.	**Number of Tehsils**	No.	102
5.	**Number of Towns**	No.	86
6.	**Development blocks**	No.	95
7.	**Gram Panchayat**	No.	7950
8.	**Nyaya Panchayat**	No.	670

Source: Uttarakhand at a Glance (2016-17)

3.1.2 Demographic features

In Uttarakhand, the total population is 10,086,000 with a rural population of 703,700 and urban population of 305,000 (Table 3.2). Out of total population, male and female are 513800 and 413800, respectively. The average literacy rate was 78.80 per cent and the per cent literacy rate for male and female was 87.40 and 70.00, respectively.

Table 3.2: Demographic features of Uttarakhand

S.No.	Particulars	Unit	Uttarakhand
1.	**Area**	Sq. Km	53483
2.	**Total population**	Lakh	100.86
a.	**Male**	Lakh	51.38
b.	**Female**	Lakh	41.38
3.	**Rural population**	Lakh	70.37
4.	**Urban population**	Lakh	30.50
5.	**Sex ratio**	Per 1000	963
6.	**Literacy rate**	Per cent	78.80
a.	**Male**	Per cent	87.40
b.	**Female**	Per cent	70.00

Source: Census 2011, Government of India

3.1.3 Land utilization pattern

The land use pattern of Uttarakhand has been shown in Table 3.3. Out of the total reported area, net sown area was 700171 ha which accounts for about 11.68 per cent of the total area. The maximum portion of Uttarakhand is reported to be under forests with 3799953 ha, which is 63.41 percent of the total area. Cultivable waste land accounts for 5.28 per cent and the area under orchards and shrubs occupy 6.47 per cent of the total area.

Table 3.3: Land use pattern in Uttarakhand (2015-16)

S. No.	Particulars	Area in Uttarakhnad (ha)
1.	**Total reported area**	5992604 (100.00)
2.	**Area under forest**	3799953 (63.41)
3.	**Culturable waste land**	316984 (5.28)
4.	**Current fallow**	57276 (0.95)
5.	**Fallow land other than current fallow**	86334 (1.44)
6.	**Barren and un-culturable land**	228200 (3.80)
7.	**Land under non-agricultural use**	223792 (3.73)
8.	**Permanent pasture and other grazing land**	192077 (3.20)
9.	**Orchard and shrubs not included in net sown area**	387817 (6.47)
10.	**Net area sown**	700171 (11.68)

Source: Uttarakhand at a Glance (2016-17)
Figures in the parentheses indicate percentage to total

3.1.4 Land holding pattern

The distribution of land holdings in Uttarakhand is shown in Table 3.4. The table illustrates that 73.69 per cent individuals consist of marginal land holdings followed by small farmers who constitute 17.21 per cent and remaining come under medium and large holdings with 8.99 and 0.11 per cent respectively. The marginal land holdings occupy 36.28 per cent of the total area followed by medium size of land holding.

Table 3.4: Distribution of land holdings in Uttarakhand (2011)

Category of farm	Number of holdings	Per cent to total holdings	Total area occupied (ha)	Per cent to area occupied
Marginal holdings (<1 ha)	6,72,000	73.69	2,96,000	36.28
Small holdings (1-2 ha)	1,57,000	17.21	2,25,000	27.57
Semi-medium and medium holdings (2-10 ha)	82,000	8.99	2,70,000	33.09
Large holdings (>10 ha)	1,000	0.11	25,000	3.06
Total	9,12,000	100.00	8,16,000	100.00

Source: Uttarakhand at a Glance (2016-17)

3.1.5 Sources of Irrigation

Uttarakhand holds net irrigated area of 329964 ha. Tube wells are the major source of irrigation in Uttarakhand followed by canals which contribute 56.94 and 23.86 per cent of net irrigated area respectively. Tanks and other sources account for only 0.009 per cent and 7.29 per cent of net irrigated area, respectively. (Table 3.5)

Table 3.5: Source-wise irrigated area in Uttarakhand (2015-16)

S. No.	Source of irrigation	Net irrigated area (ha)	Percentage of net irrigated area
1	**Canals**	78743	23.86
2	**Tube wells**	187925	56.94
3	**Other Wells**	39207	11.18
4	**Tanks**	31	0.009
5	**Other sources**	24058	7.29
6.	**Total**	329964	100.00

Source: Uttarakhand at a Glance (2016-17)

3.1.6 Classification of workers

Table 3.6 shows that the total population of Uttarakhand is 100.86 lakh. Majority of its population lies in rural areas (70.37 lakh). Its total working population is 38.72 lakh with majority of workers are from rural areas (28.85 lakh). Total non-workers in Uttarakhand is 62.14 lakh out of which 41.51 lakh workers reside in rural areas and 20.62 lakh workers reside in urban areas. Total male working population of the state is 25.51 lakh which is 12.33 lakh higher than female working population (13.20 lakh) of the state.

Table 3.6: Classification of workers Uttarakhand (2011)

(In lakhs)

S. No.	Particulars	Uttarakhand		
		Total	**Rural**	**Urban**
1.	**Total population**	100.86	70.37	30.49
2.	**Total working population**	38.72	28.85	9.86
3.	**Total main workers**	28.70	19.97	8.73
4.	**Total marginal workers**	10.01	8.82	1.134
5.	**Total Non-workers**	62.14	41.51	20.62
6.	**Male population**	51.37	35.19	16.18
7.	**Male working population**	25.51	17.26	8.25
8.	**Male main workers**	20.70	13.22	7.48
9.	**Female population**	49.48	35.17	14.30
10.	**Female working population**	13.20	11.58	1.61
11.	**Female main workers**	7.99	6.74	1.25

Source: Agricultural Statistics at a glance, 2016-17

3.1.7 Work participation rate in Uttarakhand

In Uttarakhand, 38.40 per cent of population was workers. Among females, this proportion was 26.70 per cent while it was 49.70 per cent among males. Table 3.7 showed that proportion of main workers to total workers was 74.10 per cent while rest were marginal workers.

Table 3.7: Work participation rate in Uttarakhand (2011)

(In percentage)

S. No.	Workers	Uttarakhand
1.	**Male working population to total male population**	49.70
2.	**Female working population to total female population**	26.70
3.	**Total working population to total population**	38.40
4.	**Per cent of Main Workers to Total Workers**	74.10
5.	**Per cent of Marginal Workers to Total Workers**	25.90

Source: Census of India, 2011

3.1.8 Cropping pattern

Area under different crops in Uttarakhand is shown in Table 3.8. Table revealed that wheat and paddy were the most important crops occupying 31.59 per cent and

23.11 per cent area of their cropped area, respectively. Sugarcane, vegetables and mandua are other important crops of the state.

Table 3.8: Area under different crops in Uttarakhand (2015-16)

S. No.	Crops	Area (ha)	Percentage of total cropped area
1.	**Paddy**	250297	23.11
2.	**Wheat**	342131	31.59
3.	**Barley**	18850	1.74
4.	**Maize**	23207	2.14
5.	**Mandua**	107427	9.92
6.	**Total cereals**	800936	73.97
7.	**Total pulses**	62864	5.80
8.	**Total food grains**	863800	79.78
9.	**Oilseeds**	32218	2.97
10.	**Sugarcane**	96854	8.94
11.	**Potato**	25889	2.39
12.	**Vegetables**	63945	5.90
13.	**Total cropped area**	1082706	100.00

Source: Uttarakhand at a Glance (2016-17)

3.2 General features of Nainital district

3.2.1 Geographical features

The district Nainital is situated in the Himalayan and sub-Himalayan region of Uttarakhand. Nainital district comes under Kuamon region and is bounded in the east by district Champawat, in the west by district Bijnor, north-west by Garhwal, north by district Almora, in the south by district of Udham Singh Nagar. It covers a geographic area of 4,251 sq km and lies in latitude 29º00”N 29º05” north latitude and 78º80”E 80º14” east longitude. The district has 8 Tehsils, 8 Development blocks, 511 Gram panchayat, and 44 Nyaya panchayat (Table 3.9). This district comprises of three geographical parts: Hills, Tarai and Bhabar. It is comprised of eight blocks, namely Bhimtal, Betalghat, Dhari, Haldwani, Okalkanda, Kotabagh, Ramgarh and Kotabagh.

Table 3.9: General features of Nainital District

S. No.	Particulars	Unit	Statistics
1.	**Total geographical area**	Sq. km	4251
2.	**Number of Tehsils**	No.	8
3.	**Development blocks**	No.	8
4.	**Gram Panchayat**	No.	511
5.	**Nyaya Panchayat**	No.	44

Source: Sankhiyiki Patrika 2016.

3.2.2 Climate and rainfall

In Nainital district average temperature ranges from -5.4˚ C to 40.2˚ C and average relative humidity of the district varies from 60 to 70 per cent. The annual total rainfall is more than 1800 mm, out of which more than 90 per cent precipitation is received from summer monsoon i.e. June to mid-October and remaining from the winter cyclone i.e. January-March.

3.2.3 Soils

The soils in the district have developed on the rocks with biotic and phylitic materials, under cool and moist climate and temperate forest cover. The soils are generally shallow and gravelly. Deep soils are confined to hill slope and valleys. Organic matter status and phosphorus content are medium in soil. Water percolation through profile is very rapid, whereas, nutrient and moisture retention capacity and fertility of soils is low in the district.

3.2.4 Demographic features

The Nainital district of Uttarakhand has the population of 9.54 lakh with rural population of 5.82 lakh and urban population of 3.71 lakh (Table 3.10). The average literacy rate was 83.88 per cent and population density was 225 per square km.

Table 3.10: Demographic feature of Nainital district

S. No.	Particulars	Unit	Nainital
1.	**Total population**	Lakh No.	9.54
2.	**Rural**	Lakh No.	5.82
3.	**Urban**	Lakh No.	3.71
4.	**Literacy**	Per cent	83.88
5.	**Male**	Per cent	90.07
6.	**Female**	Per cent	77.29
7.	**Population density**	Per sq. km	225

Source: Statistical Bulletin, Nainital district, Uttarakhand (2016-17)

3.2.5 Land use pattern

The table 3.11 shows that the total area available is 408005 hectares. Out of this 298236 hectares is under forest which accounts for 73.10 per cent, present fallow is 3244 hectares and other fallow land is 3552 hectares. Cultivable waste was 6.36 per cent to the total reported area while land under non-agriculture use was 2.61 per cent. Net area sown was covered 10.79 per cent of the total reported area.

Table 3.11: Land use pattern in Nainital district (2015-16)

(ha)

S. No.	Particulars	Area	Percentage of total reported area
1.	**Total reported area**	408005	100.00
2.	**Forests**	298236	73.10
3.	**Cultivable waste**	25969	6.36
4.	**Land under non agricuture use**	10643	2.61
5.	**Permanent pastures**	304	0.07
6.	**Land under misc. tree crops & groves**	21265	5.21
7.	**Barren & uncultivable land**	967	0.24
8.	**Current fallows**	3244	0.80
9.	**Other fallows**	3552	0.87
10.	**Net sown area**	44005	10.79

Source: Pragati Prativedan 2016-17

3.2.6 Land holding pattern

The land holding pattern of Nainital district is given in Table 3.12 which shows that 67.57 per cent individuals possessed marginal land holdings, occupying 29.47 per cent of total area. Small farmers accounted for 19.02 per cent of total holdings with operational land holdings of 25.85 per cent of total area. Semi-medium and medium category constituted a major fraction i.e. 40.22 per cent of total area with 13.07 per cent of that total holding. While large farmers accounted for only 0.32 per cent with 4.44 per cent of total area.

Table 3.12: Distribution of land holdings in Nainital district (2011)

S. No.	Category of farm	Number of holdings	Per cent of total holdings	Total area occupied (ha)	Per cent area occupied
1.	**Marginal holdings (<1 ha)**	34234	67.57	16475.5	29.47
2.	**Small holdings (1-2 ha)**	9637	19.02	14450.52	25.85
3.	**Semi-medium and medium holdings (2-10 ha)**	6625	13.07	22484.15	40.22
4.	**Large holdings (>10 ha)**	167	0.329	2484.22	4.44
5.	**Total**	50663	100	55894.39	100.00

Source: Statistical Bulletin, Nainital district, Uttarakhand (2016-17)

3.2.7 Occupational distribution of the population

Most of the population in the district was involved in the agriculture for their livelihood. Farmer and agricultural labourers together accounted for 32.11 per cent work force (Table 3.13). The table indicates that only 1.82 per cent individuals were engaged in family business while 21.20 per cent individuals were under the category of marginal workers.

Table 3.13: Occupational distribution of population Nainital district (2011)

S. No.	Particulars	Total number	Percentage of total worker
1.	**Total workers**	376181	100
Main workers			
a.	**Farmers**	101221	26.90
b.	**Agricultural labourers**	19618	5.21
c.	**Household industry worker**	6873	1.82
d.	**Other worker**	168712	44.84
e.	**Subtotal**	296424	78.80
Marginal workers			
2.	**Marginal worker**	79757	21.20

Source: Statistical Bulletin, Nainital district, Uttarakhand (2016-17)

3.2.8 Sources of irrigation

The major source of irrigation in the district is canals, covering about 82.03 per cent of total irrigated area. As high as 4751 ha area was irrigated by tube wells out of which 13.75 per cent area was irrigated by government tube wells and 4.14 per cent area by private tube wells (Table 3.14).

Table 3.14: Source-wise irrigated area of Nainital district (2015-16)

S. No.	Source of irrigation		Area (ha)	Percentage of net irrigated area
1.	**Canals**		21779	82.03
2.	**Tube wells**	**Government**	3651	13.75
		Private	1100	4.14
3.	**Wells**		-	-
4.	**Ponds**		-	-
5.	**Others**		19	0.07
6.	**Total**		26549	100.00

Source: Statistical Bulletin, Nainital district, Uttarakhand (2016-17)

3.2.9 Cropping pattern

Table 3.15 reveals that wheat and paddy were the most important crops occupying 35.36 and 17.72 per cent area respectively, in the year 2014-15. Vegetables and oilseeds also occupied important share after these two cereal crops with 13.37 and 11.04 per cent respectively.

Table 3.15: Area under different crops in Nainital district (2015-16)

S. No.	Crops	Area (ha)	Percentage of total cropped area
1.	**Paddy**	11793	17.72
2.	**Wheat**	23524	35.36
3.	**Barley**	1006	1.51
4.	**Maize**	3770	5.66
5.	**Mandua**	2374	3.56
6.	**Total cereals**	42915	64.51
7.	**Total pulses**	1941	2.91
8.	**Total food grains**	44856	67.43
9.	**Oilseeds**	7347	11.04
10.	**Sugarcane**	3721	5.59
11.	**Potato**	1694	2.54
12.	**Vegetables**	8899	13.37
13.	**Total cropped area**	66517	100.00

Source: Statistical Bulletin, Nainital district, Uttarakhand (2016-17)

3.3 Geographical, demographic and agricultural features of Bhimtal and Ramnagar blocks of Nainital district

3.3.1 Geographical features Ramnagar and Bhimtal blocks (study area)

Ramnagar is located at 29.40°N 79.12°E coordinates while Bhimtal is 29.35°N 79.57°E. Ramnagar has an average elevation of 345 metres (1,132 feet) while Bhimtal has 1370 m above sea levels. Bhimtal and Ramnagar are 22.5 km and 64 km away from the district headquarter respectively. Bhimtal has geographical area of 165 sq.km. Whereas Ramnagar has 213 sq.km. Ramnagar is located at the foothills of the Himalayas on the bank of river Kosi. The town is well-known for being the gateway to Corbett National Park, western Kumaon and Garhwal. Ramnagar is also famous for "Litchi farming". Bhimtal is a hilly area as a gateway for Nainital a famous hill station. The block experiences varying tropical to sub-tropical weather conditions.

3.3.2 Soils

Bhimtal has hilly area hence gives the reflection of same properties as of hilly areas of district and State. Soils of this area have gravel column and have low water holding capacity and fertility. Ramnagar has the richer soils than Bhimtal because of several reasons. Firstly it is situated at the very beginning of the Ganga plains therefore all the fertile immersion the river has carried with it and get deposited on its banks in foot hills. The river could no longer storm its way through various areas as it had done during its upper course. The rich alluvial deposits make for excellent agricultural land. The reason for this fertility is its ideal location exactly between the hills and onset of the plains region.

3.3.3 Climate and Rainfall

Ramnagar and Bhimtal enjoy pleasant weather throughout the spring, summer and autumn with the winter temperatures dropping drastically. The climate is pleasant all through the day with chilly night's air; the cold mornings too are pleasant through the day and pleasant in the evenings almost all the year through. The mean annual temperature of Ramnagar is 23.1˚ C while Bhimtal is 15.7˚ C. The average annual rainfall is nearly 1659 mm in Ramnagar which is 12 mm less than the Bhimtal. The variation in annual precipitation is 483 mm and 485 mm in Bhimtal and Ramnagar blocks respectively. The relative humidity ranges between 60 to 70 percent for both the blocks.

3.3.4 Demographic features

As illustrated in Table 3.16, total area covered by Ramnagar and Bhimtal was 213 and 165 sq. km, respectively. Total population was 97916 and 52043, out of which number of males 50072 and 26966 along with 47844 and 25077 females, respectively in two blocks. The proportion of female was slightly high in Ramnagar block than the Bhimtal. The Bhimtal has nearly 9 percent more literacy rate than the Ramnagar. The population density of Ramnagar was 68 people per sq.km. more in comparion to Bhimtal.

Table 3.16: Demographic features of Ramnagar and Bhimtal blocks

S. No.	Particulars	Unit	Ramnagar	Bhimtal
1.	**Total area**	Sq. km	213	165
2.	**Male population**	Thousand	50072	26966
3.	**Female population**	Thousand	47844	25077
4.	**Total population**	Thousand	97916	52043
5.	**Rural**	Thousand	81.56	52.04
6.	**Urban**	Thousand	-	-
7.	**Literacy**	Per cent	78.97	87.73
8.	**Male**	Per cent	86.9	94.23
9.	**Female**	Per cent	70.84	80.73
10.	**Population density**	Per sq. km	383	315

Source: Census of India, 2011,

3.3.5 Cropping pattern

The Table 3.17 clearly depicts that paddy and wheat were main crops grown in Ramnagar block together covering about 59.20 per cent of the total cropped area. In case of Bhimtal block wheat, maize and mandua were together grown over 54.48 per

cent of the area. It was further observed that oilseed was another important crop grown in Ramnagar while vegetables were significantly grown in bhimtal block.

Table 3.17: Area under different crops in Ramnagar and Bhimtal blocks. (2015-16)

S. No.	Crops	Ramnagar	Bhimtal
		Area (ha)	Area (ha)
1.	Paddy	4344 (25.40)	305 (5.84)
2.	Wheat	5782 (33.80)	1308 (25.04)
4.	Maize	325 (1.90)	727 (13.92)
6.	Sava	2 (0.01)	1088 (20.83)
6.	Total cereals	10453 (61.12)	3428 (65.62)
7.	Total pulses	239 (1.40)	99 (1.90)
8.	Total food grains	10692 (62.52)	3527 (67.51)
9.	Oilseeds	2551 (14.92)	182 (3.48)
10.	Sugarcane	392 (2.29)	-
11.	Others	3468 (20.28)	1515 (29.00)
12.	Total cropped area	17103 (100.00)	5224 (100.00)

Source: Sankhiyiki patrika 2016-17
Figures in the parentheses indicate percentage to total

3.3.6 Land use pattern

According to the given Table 3.18, Ramnagar block has geographical area and forest area of 23696 hectare and 9814 hectare, respectively. The Bhimtal has 5 percent more forest cover than the Ramnagar. Cultivable waste land is nearly 7 percent more in Bhimtal than the Ramnagar while vice versa for Land under non agriculture use. Land under misc. trees and groves were about 14 per cent high in Bhimtal as compare to

Bhimtal. The net sown area in Ramnagar block has nearly twice the area under Bhimtal. The area under other categories is nearly same in proportion for both the blocks.

Table 3.18: Land utilization pattern of Ramnagar and Bhimtal blocks (2015-16)

S. No.	Particulars	Unit	Bhimtal	Percentage of total reported area	Ramnagar	Percentage of total reported area
1.	**Total reported area**	Ha	19999	100.00	22918	100.00
2.	**Forests**	Ha	9520	47.60	9814	42.82
3.	**Cultivable waste**	Ha	1937	9.69	582	2.54
4.	**Land under non agriculture use**	Ha	29	0.14	1646	7.18
5.	**Permanent pastures**	Ha	92	0.46	-	-
6.	**Land under misc. tree crops & groves**	Ha	2679	14.40	10	0.04
7.	**Barren & uncultivable land**	Ha	198	0.99	89	0.39
8.	**Current fallows**	Ha	664	3.32	345	1.42
9.	**Other fallows**	Ha	754	3.77	777	3.39
10.	**Net sown area**	Ha	4126	20.63	9655	42.13
11.	**Area sown more than once**	Ha	1098	5.49	7448	32.50
12.	**Grossed sown area**	Ha	5224	-	17103	-
13.	**Cropping intensity**	%	127	-	177	-

Source: Sankhiyiki patrika 2016-17

3.3.7 Land holding pattern

Table 3.19 depicts that the maximum area in Ramnagar block was under medium landholding category which accounts for 29.56 percent of the total area. Whereas in Bhimtal highest area was under small landholding category i.e.. 31.60 percent of total area covered. These figures depicts that Bhimtal has more small and fragmented land holding as compared to Ramnagar.

Table: 3.19: Land holding pattern of Ramnagar and Bhimtal blocks (2011)

S. No.	Classification of area	Ramnagar		Bhimtal	
		Number	Area	Number	Area
1.	Marginal holdings (<1 ha)	4281 (62.39)	1579.49 (17.64)	8195 (77.04)	5001.13 (48.04)
3.	Small holding (1.0-2.0 ha)	1119 (16.31)	1735.51 (19.39)	1820 (17.11)	3289.79 (31.60)
4.	Medium holding (2-4.0 ha)	996 (14.51)	2646 (29.56)	526 (4.94)	1539.2 (14.78)
5.	Semi medium holding (4-10 ha)	418 (6.09)	2374.23 (26.52)	93 (0.87)	511.74 (4.91)
6.	Large holding (>10ha)	48 (0.70)	616.41 (6.89)	4 (0.04)	70.41 (0.68)
7.	Total	6862 (100.00)	8951.64 (100.00)	10638 (100.00)	10412.86 (100.00)

Source: Sankhiyiki Patrika 2016-17
Figure in the parentheses indicate percentage to total

3.3.8 Sources of irrigation

The Table 3.20 depicts that the Ramnagar block has 9519 ha irrigated area while Bhimtal has only 280 ha irrigated area. Out of the total irrigated area in Bhimtal, nearly 96 per cent is irrigated through the canal. The canal contribution as a source of irrigation in Ramnagar was 66.96 per cent. Tube wells were the sources of irrigation for nearly one third irrigated area of Ramnagar block.

Table 3.20: Sources of irrigation in Ramnagar and Bhimtal blocks (2015-16)

S. No.	Source of irrigation		Ramnagar		Bhimtal	
			Area (ha)	Percentage	Area (ha)	Percentage
1.	Canals		6374	66.96	268	95.71
2.	Tube wells	Government	2488	26.13	-	-
		Private	657	6.90	-	-
3.	Wells		-	-	-	-
4.	Ponds		-	-	-	-
5.	Others		-	-	12	4.29
6.	Total		9519	100	280	100

Source: Sankhiyiki patrika 2016-17

3.3.9 Work participation rate

Table 3.21 illustrates that the only 37.94 and 42.35 percent people were working in Ramnagar and Bhimtal, respectively while rest were non workers. In case of non-workers the proportion of females was higher than male in both the blocks. The percentage share of non-working female was 37.48 and 33.48 percent in Ramnagar and Bhimtal blocks respectively. Among categories of the total working population the male proportion was higher in all categories. Further it was also observed that the female workforce proportion as farmers out of total population were twice in Bhimtal than the Ramnagar. Ramnagar has four times more agricultural labourers than the Bhimtal.

Table 3.21: Classification of workers in Bhimtal and Ramnagar block (2011)

Block		**Ramnagar**			**Bhimtal**		
S. No.	**Particulars**	**Males**	**Females**	**Total**	**Males**	**Females**	**Total**
1.	**Total workers**	26005 (26.56)	11142 (11.38)	37147 (37.94)	14389 (27.65)	7650 (14.70)	22039 (42.35)
a.	**Farmers**	8681 (8.87)	4245 (4.33)	12925 (13.20)	5283 (10.15)	5002 (9.61)	10285 (19.76)
b.	**Agricultural labourers**	6267 (6.40)	3529 (3.60)	9796 (10.00)	938 (1.80)	446 (0.85)	1384 (2.65)
c.	**Household industry worker**	648 (0.66)	388 (0.40)	1036 (1.06)	346 (0.66)	362 (0.69)	708 (1.30)
d.	**Other worker**	10410 (10.63)	2980 (3.04)	13390 (13.67)	7822 (15.03)	1840 (3.53)	9662 (18.56)
2.	**Non workers**	24067 (24.58)	36702 (37.48)	60769 (62.06)	12577 (24.16)	17427 (33.48)	30004 (57.65)
3.	**Total population**	50072 (51.14)	47844 (48.86)	97916 (100.00)	26966 (51.82)	25077 (49.18)	52043 (100.00)

Source: Sankhiyiki patrika 2016-17
Figure in the parentheses indicate percentage to total

Methodology

Chapter 4 METHODOLOGY

Methodology is an important component of research investigation. In order to fulfill the objective of the study, an appropriate methodology is inevitable. This chapter deals with the methodological details including sampling procedure followed to select respondents, nature and source of data collected for the study and analytical tools and techniques employed to analyze the data. The methodology adopted in the present study is presented under the following headings.

4.1 Study area

4.2 Nature and sources of data

4.3 Sampling design

4.4 Analytical framework

4.1 Study area

This study was conducted in the Nainital district of Uttarakhand. This district accounted for maximum number of beekeepers rearing *Apis mellifera* (200) and highest production of honey (396 MT) among all districts of Uttarakhand in 2016-17 (**Rajkiya Moan Palan Kendra, Jeolikote**). Nainital district has abundant litchi orchards and immense potential for boosting honey production. In this area large numbers of registered beekeepers are engaged in migratory beekeeping, mainly rearing *Apis Mellifera* species, to provide desired flora to the bees in view to explore their potential to produce honey.

4.2 Nature and sources of data

The primary data regarding socio-economic characteristics (like age, education, land holding, main occupation social participation, family size, etc.) were collected from sample beekeepers. Also, information about capital investment, operational expenses incurred in beekeeping, return from sale of bee products and marketing practices followed were collected from the sample beekeepers by personal interview method pertaining to year 2017-18, using a pre-tested structured survey schedule designed for the study. Secondary data was collected from various published and un-published sources such as records of Khadi Village Industries Commission, Haldwani; Krishi Vigyan Kendra, Nainital; Rajkiya Moan Palan Kendra, Jeolikote; National Bee-Board, Dehradun, etc.

4.3 Sampling design

Nainital district is comprised of eight blocks out of which Bhimtal and Ramnagar blocks were selected purposely for the study on the basis of potentiality for beekeeping. A list of beekeepers of both the blocks registered with National Bee Board having more than 10 hives was obtained from Rajkiya Moan Palan Kendra (RMPK), Jeolikote. As most of registered beekeepers were rearing *Apis Mellifera* species through migratory beekeeping practices, 30 migratory beekeepers from each block were selected randomly from the list and in all 60 beekeepers were included in the sample for detailed analysis. These beekeepers were classified into three categories: small beekeepers (10 to 70 bee colonies), medium beekeepers (71 to 140 bee colonies) and large beekeepers (above 140 bee colonies).

4.4 Analytical framework

Statistical analysis of quantitative data is an important aspect of research work, as it facilitates interpretation of the data. Data were analyzed in the light of objectives of the study. Statistical tools and techniques used in the study are described in the following sub sections.

4.4.1 Socio-economic characteristics of honey producers and ongoing beekeeping practices

To study the socio-economic attributes of beekeepers, information on different variables like age, education, land holding, occupation, social participation, family size and experience in beekeeping, number of honey harvest, production of bee products etc. were analyzed using simple descriptive statistical tools like percentage, weighted average, etc. Percentage values were calculated to make simple comparison. These were calculated by dividing the frequency of particular cell by total number of beekeepers and multiplying by 100. Symbolically,

$$P = \left(\frac{f}{n}\right) \times 100$$

Where, f = Frequency of particular cell; n= Total number of beekeepers; P= Percentage

4.4.2 Costs of and returns from honey production

To estimate the cost of and returns from honey production, data related to expenses on different components of beekeeping and returns from sale of honey and other by-products were analyzed using the simple descriptive statistical tools. In the present study cost and returns were estimated for the unit hive.

Cost of Beekeeping

Total fixed cost (TFC) and Total variable cost (TVC) were added to arrive at total cost incurred on maintaining a unit of hive.

I. Fixed cost

TFC is the total fixed cost which includes the interest on the present value of fixed capital assets and depreciation value on equipment and machinery. The fixed asset items were beehive, bee colony, honey extractor, smoker, gloves, feeder and beeveil.

Depreciation value

The straight-line method was employed to compute the depreciation on fixed assets. The expected life of equipment and machinery was taken into consideration through the references of beekeepers and honey bee specialist of RMPK, Jeolikote. The items used even after completion of expected life were categorized as junked item. Their value was taken as zero as these items were not having any resale value as reported by the beekeepers. To compute the annual depreciation in the value of assets following formula was used:

$$\text{Annual depreciation} = \frac{\text{Initial purchase price of the item (Rs.)}}{\text{Estimated life of the item (yrs)}}$$

Interest on fixed assets

The simple interest for present value of fixed assets items was computed at the 10 per cent rate of interest per year through following formula,

$$\text{Simple interest (Rs.)} = \frac{\text{Principal amount} \times \text{Rate} \times \text{Time}}{100}$$

II. Variable costs

TVC is the total variable cost, which included the following items.

a) Cost of comb foundation sheets.
b) Cost of feed (sugar syrup)
c) Cost of medicines and chemicals
d) Cost of labour (Hired + owned)
e) Cost on migration
f) Cost on honey storage containers
g) Miscellaneous expenses
i) Interest on working capital

The costs of above-mentioned items were computed as follows:

i) The cost of artificial feed (sugar) was calculated based on the beekeeper's purchase pattern of sugar. The quantities of the sugar bought during different months from the different place were recorded and their weighted average was worked out.

ii) The cost incurred on migration comprises of cost of transportation, land rent, labour cost for boarding and loading of hives during each shift of bee colonies.

iii) The cost incurred on hired labour, comb foundation sheet, jute bag, storage bin and medicine were estimated based on the discussion with the beekeepers and family labour was calculated as per the wage of skilled labour for a manday (8 hrs) prevailing in the locality.

iv) Interest on working capital has been charged at the rate of 10 per cent per annum for half year on the sum of total paid variable costs.

Returns from Beekeeping

Returns were estimated as illustrated below

Total revenue (TR) = RSH + RSC+ RSW

Where,

RSH= Returns from sale of honey, RSC = Returns from sale of colonies and RSW= Returns from sale of wax.

Gross Margin over Variable Cost = TR - TVC

Profit = Gross Margin over Total Cost = GM – TC

Where,

TR = Total Revenue

GM = Gross Margin

TC = Total Cost

TVC = Total Variable Cost

TFC = Total Fixed Cost

Returns from honey:

The price of honey varies in accordance with the sale of honey at onset and offset of season along with the type of flora from which it was produced. Therefore, for estimation of returns, the quantities of different type of honey produced from different bee flora and at prices honey was sold to different buyers recorded by the beekeepers were considered. The weightage average and percentage was employed to work out it.

Returns from sale of bee colonies

As beekeeping is self-perpetuating enterprise, the multiplication of bee colonies is seen. New colonies are either used by beekeepers to expand their apiary size or sold to

other beekeepers. The value of the net increase in colonies was evaluated at the prevailing prices in the locality and accordingly returns were computed.

Returns from wax

Wax is important by-product obtained from beekeeping but in small quantity. The sale price of wax produced was estimated at prices prevailing in the locality.

Cost of honey and other bee products

As bee products were jointly produced, to estimate the cost of production of different bee products individually, the relative sale value method of joint cost allocation was followed. This method allocates joint costs based on estimated sales value of the given joint product relative to the sales value of total joint production. This is illustrated through the following formula:

$$\text{Cost Allocated to a Joint Product} = \frac{\text{Sale Value of the Product}}{\text{Sales Value of Total Production}} \times \text{Total Joint Costs}$$

Sales value at split-off method is based on the assumption that the market value of the products is a proxy for their production costs. The assumption is that if a product has a higher value to the market, then it must be the case that the product has higher costs of production.

Net profit

Net profit was calculated through deducting the total cost of production from the gross returns from beekeeping.

Output to input ratio

It was calculated by dividing the gross returns from total cost of production.

4.4.3 Factors affecting honey output

To examine the influence of various explanatory variables on the honey output, regression analysis has been performed. Following linear and log linear forms of the regression model were attempted for the analysis.

Linear regression: $Y = a + b_1X_1 + b_2X_2 + \ldots + b_nX_n$.

Loglinear regression $LnY = \beta_0 + \beta_1 \log x_1 + \beta_1 \log x_2 + \beta_3 \ln X_3 + \ldots + \beta n \log Xn + \mu$

Where:

Dependent variable Y = honey output (Kg/Hive/Year)

Xn= Explanatory variables

β_0 is a constant, β_1 - βn are regression parameters that were estimated,

The description of explanatory variables: X_1 to Xn is given in table 4.1.

Table 4.1: Explanatory variables description

S. No.	Explanatory variable X	Variable types	Unit of measurement	Sign of β
X_1	**Age of beekeeper**	Continuous	Years	-
X_2	**Education level**	Continuous	Years	+
X_3	**Social group member**	Dummy	1.No, 2.Yes	+
X_4	**Number of training attended**	Continuous	Numbers	+
X_5	**Beekeeping Experience**	Continuous	Years	+
X_6	**Apiary size**	Continuous	Numbers	+
X_7	**Supplementary feed**	Continuous	Kg/ hive	+
X_8	**Number of migration**	Continuous	Numbers	+
X_9	**Cost on medicine and chemicals**	Continuous	Rs./ hive	+
X_{10}	**Labour**	Continuous	Man days/ hive	+
X_{11}	**Forest land use right**	Dummy	1.No, 2.Yes	+
X_{12}	**Family size**	Continuous	Numbers	+
X_{13}	**Household Annual income**	Continuous	Rs.(in ,000)	+

u_i = residuals

Prior to fit a model for estimation of factor affecting honey output zero order correlation matrix of explanatory variables was analyzed to check the multicollinearity. On analysis it was observed that out of above-mentioned models, log linear model was best fitted for regression analysis so it was finally employed to estimate the factors affecting honey output. Estimation of regression coefficient involved the use of ordinary least square (OLS) regression technique. Further, the‘t’ test was used to test the significance of coefficient of regression.

4.4.4 Disposal pattern of honey output

To attain fourth objective, information about the existing market practices followed by beekeepers was gathered. Disposal pattern for sale of honey by beekeeper was identified. In order to determine the disposal pattern, following marketing measures were estimated using the simple descriptive statistical tools like percentage, average, etc.

Marketable and marketed surplus

Out of total produced honey, the amount of honey available for sale in market was estimated after deducting the amount utilized for self-consumption, gift to relatives, and retained for sale in off season. Further, the actual amount of honey that was sold in market, referred as marketed surplus, was also estimated.

Level of production and sale of honey

Under this month-wise production and sale of honey along with average sale price of honey received by beekeepers was examined.

Marketing channels

The different channels involved in the marketing of honey were identified. Beekeeper's pattern to follow a particular marketing channel for disposal of their honey was analyzed. In addition to this, the quantity and percentage of honey sold through these channels was also worked out. Simple descriptive analysis using weighted average and percentage were employed as analytical tools.

4.4.5 Constraints faced by the beekeepers in production and marketing of honey

To estimate the constraint experienced by beekeepers, problems faced by beekeepers in running the beekeeping venture were enumerate. Based on discussion with beekeepers, extension personnel and review of literature, a list of 19 constraints was prepared. Out of these constraints, 11 were related to production of honey and 8 were to marketing aspect of honey. The respondents were asked to rank these constraints in the decreasing order of importance. These ranks were analyzed through Garrett's ranking technique. These ranks were then transformed into per cent position by using the following formula:

$$\text{Per cent position} = \frac{100(R_{ij} - 0.50)}{N_j}$$

Where,

R_{ij} = Rank given for the ith factor by the jth individual

N_j = Number of factors ranked by the jth individual.

The per cent position of each rank obtained was converted into scores by referring to the table given by Garrett and Woodworth (transmutation of orders of merit into units of amount or scores). For each factor scores of all individual respondent were added and then divided by the total number of respondents for the specific factor (mean score) attributes.

The mean score for the factors were arranged in descending order and thus ranks were assigned to the constraints.

Results & Discussion

This chapter is devoted to the presentation, discussion and interpretations of the findings related to the different objectives of the study as mentioned in Chapter-1. This chapter comprises five sections. Section 5.1 provides an insight into socio-economic characteristics of honey producers and ongoing beekeeping practices followed by them in the study area. The second section 5.2 deals with the costs of and returns obtained from apiary of beekeepers. The factors affecting honey production are discussed in Section 5.3. The fourth section 5.4 describes the disposal pattern of honey output adopted by beekeepers in the area. Lastly, section 5.5 throws light on major constraints associated with beekeeping in production and marketing of honey that were coming in the way of the beekeepers.

5.1 Socio-economic status of the beekeepers and ongoing beekeeping practices

In this section, socio-economic status of the beekeepers along with ongoing practices undertaken by them has been described in two different sub sections. The socio-economic status of the beekeepers consists of such features of household as age-wise distribution, distribution of livestock, cropping pattern, family composition, education level, size of operational holdings, investment, annual income, sources of the income, training attended and beekeeping experience of the beekeepers. These are dealt with in sub-section 5.1.1. Further the ongoing beekeeping practices consisting of types of beehives, migration pattern, number of honey harvest, production, storage, processing and marketing have been discussed in sub-section 5.1.2. The socio-economic conditions coupled with prevailing practices affect the decision of beekeepers related to management of bee colonies in various aspects such as migratory route, size of apiary, adoption of new technology etc.

5.1.1 Socio-economic characters of the beekeepers

Socio-economic factors play an important role in obtaining a general overview of honey producers in the area. Respondents have been classified into three categories based on the apiary size (number of bee colonies). These three categories of beekeepers are: small beekeepers (10 to 70 bee colonies), medium beekeepers (71 to 140 bee colonies) and large beekeepers (above 140 bee colonies). The important socio-economic characteristics of beekeepers are described in the following sub sections.

5.1.1.1 Age structure of the beekeepers

Age is considered as an important socio-economic character which influences the capability and efficiency of an individual. In addition to this it also determines the decision making and risk bearing ability. Age was estimated on the basis of number of reported calendar years completed by the respondent at the time of interview. The beekeepers were categorized in four groups based on their age and age-wise distribution of beekeepers has been presented in Table 5.1. Analysis of table reveals that on overall basis average age of beekeepers was 39.50 years. Maximum 35 out of 60 total beekeepers were from 31-45 years age group which was about 58.33 per cent of the total respondents followed by 20 per cent from 18-30 years while only two beekeepers' age was more than 60 years.

Table 5.1: Age- wise distribution of beekeepers in Nainital district

(In Number)

Category of beekeepers	Age Group					Average age(years)
	18- 30 years	31-45 years	45-60 years	More than 60 years	Total	
Small beekeepers	6 (31.58)	8 (42.11)	5 (26.32)	-	19 (100.00)	38.57
Medium beekeepers	4 (16.67)	16 (66.67)	3 (12.50)	1 (4.17)	24 (100.00)	39.58
Large beekeepers	2 (11.76)	11 (64.71)	3 (17.65)	1 (5.88)	17 (100.00)	40.41
Overall	12 (20.00)	35 (58.33)	11 (18.33)	2 (3.33)	60 (100.00)	39.50

Figures in the parentheses indicate percentage to total

On analysis of data related to different categories of beekeepers revealed that the average age was 38.57, 39.58 and 40.41 years for small, medium and large beekeepers, respectively. It indicates that average age of beekeepers increases with increase in apiary size. Maximum number of young beekeepers hold small size apiary, followed by medium size apiary. The large proportion of matured age beekeepers owned medium size apiary followed by large apiary size. It was also observed that maximum number of beekeepers in each category belonged to age group 31-45 years.

The reason for these results may be that the persons belonging to the matured age group had balanced combination of energy and experience. With this they were more efficient to perform the job than those falling in other age groups. In addition to this, young counterparts lacked experience while those from old age were averse to taking risk.

5.1.1.2 Level of income of the beekeepers

Income level of a household is the measure of combined incomes from different sources and it has effect on household consumption, saving and investment. The income determines the standard of livelihood of a household. Level of income also decides the capacity of an individual to run out the expenses incurred while operating any enterprise. The distribution of beekeepers into various income groups on the basis of their annual income has been presented in Table 5.2. For overall scenario the table clearly depicts that the annual income for the beekeepers on an average was Rs. 161330. In addition to this it was observed that 18.33 per cent of beekeepers out of total 60 beekeepers were having annual income less than one lakh rupees. The highest proportion which was about 43.33 per cent of beekeepers belonged to 1 lakh to 1.5 lakh rupees annual income group followed by 38.33 per cent with an annual income more than 1.5 lakh rupees.

Table 5.2: Distribution of beekeepers based on level of income in Nainital district

(In Number)

Beekeepers Category	Income Level Group				Average Income Rs. (,000)
	Up to 1 lakh (Rs.)	1,00,001-1.5 lakh (Rs.)	Above 1.5 lakh (Rs.)	Total	
Small beekeepers	10 (52.63)	7 (36.84)	2 (10.53)	19 (100.00)	118.42
Medium beekeepers	1 (4.16)	14 (58.33)	9 (37.51)	24 (100.00)	163.33
Large beekeepers	-	5 (28.42)	12 (70.58)	17 (100.00)	206.47
Overall	11 (18.33)	26 (43.33)	23 (38.33)	60 (100.00)	161.33

Figures in the parentheses indicate percentage to total

Among different categories of beekeepers, the average annual income for small, medium and large beekeeper was Rs. 118420, Rs. 163330 and Rs. 206470, respectively. This indicates that annual income of the beekeeper increases with increase in apiary size. Further, more than half of the small beekeepers' income was below one lakh while 95.84 per cent of medium beekeepers' household income was more than one lakh out of which 58.33 per cent had income between 1- 1.5 lakh and 37.51 per cent of medium beekeepers' income was more than 1.5 lakh. It was also found that the entire respondents from large beekeepers' category had income more than 1 lakh.

The result shows the contribution of the beekeeping as a source of income for beekeepers' household and better standard of living of beekeepers as level of income was increasing with increase in apiary size.

5.1.1.3 Land holding pattern of the beekeepers

Land holding pattern depicts the possession of land holding pursued by an individual. It is one of the most important socio- economic characters. It provides social status to the person and also strengthens the economic status of the farm household. The beekeepers were divided into various groups on the basis of size of land holding. The relationship between hive size and farm size has been presented in the Table 5.3.

The observations from the table revealed that the overall average size of land holding was 1.57 acre along with this, 8.33 per cent of beekeepers out of total 60 beekeepers were landless. The highest proportion of about 43 per cent owned land of less than one acre while 40 per cent of beekeepers had land holding between 1-4 acre. Proportion of beekeepers owning land more than 4 acre was only 8.33 per cent on overall basis as inferred from the results.

Table 5.3: Distribution of beekeepers on the basis of size of land holding in Nainital district

(In Number)

Category of beekeepers	Land Holding Group					Average (acre)
	Landless	Less than 1 acre	1-4 acre	Above 4 acre	Total	
Small beekeepers	2 (10.53)	12 (63.16)	4 (21.05)	1 (5.26)	19 (100.00)	1
Medium beekeepers	3 (12.50)	10 (41.67)	9 (37.50)	2 (8.33)	24 (100.00)	1.42
Large beekeepers	0 (0.00)	4 (23.53)	11 (64.71)	2 (11.76)	17 (100.00)	2.45
Overall	5 (8.33)	26 (43.33)	24 (40.00)	5 (8.33)	60 (100.00)	1.57

Figures in the parentheses indicate percentage to total

Further it was observed that among categories of beekeepers the average farm size for small, medium and large beekeepers was 1 acre, 1.42 acre and 2.45 acre, respectively.

In case of small beekeepers two beekeepers were landless accounting for 10.53 per cent while only 5.26 per cent of beekeepers in small category were having land holding more than 4 acres. The highest proportion of beekeepers was of those owning less than 1acre land viz. 63.16 per cent and 41.67 per cent in case of small and medium apiary size,

respectively. In case of large beekeepers category, none were landless. Further, it was found that maximum proportion of large beekeepers accounting for about 65 per cent owned land between 1-4 acres while 11.76 per cent had more than 4 acre of land holding.

The table depicts that farm size increases with the increase in apiary size. It might be due to the fact that large farm sized beekeeper has better economic status and annual income so it performs as an important supportive source of income to meet out the variable expenses incurred in management of bee colonies.

5.1.1.4 Family size of the beekeepers

Family size indicates the total number of individuals in a household. It significantly affects the socio-economic behaviour of the farm household, particularly related to occupation, income, consumption and expenditure. It also determines the possibility to adopt new subsidiary enterprise. In addition to this it reflects the availability of family labour for performing farm household activities. The family size of the beekeepers was distributed into various groups on the basis of number of members in the family (Table 5.4). Through the perusal of table it was observed that overall average size of beekeepers was 6.28 which had incidentally more than the average family size of 5 members in Uttarakhand as well as in Nainital.

Table 5.4.: Family size-wise distribution of beekeepers in Nainital district

(In Number)

Beekeepers Category	Family Size Group				Average family size
	Up to 4	5-7	8 and above	Total	
Small beekeepers	9 (47.37)	6 (31.58)	4 (21.05)	19 (100.00)	5.32
Medium beekeepers	4 (16.67)	13 (54.17)	7 (29.17)	24 (100.00)	6.42
Large beekeepers	2 (11.76)	7 (41.18)	8 (47.06)	17 (100.00)	7.18
Overall	15 (25.00)	26 (43.33)	19 (31.67)	60 (100.00)	6.28

Figures in the parentheses indicate percentage to total

Further, on overall basis 43.33 per cent of beekeepers were having family size of 5-7 persons. It was followed by family size more than 7 with proportion of 31.67 per cent families.

The table also reveals that out of 17 beekeepers in large beekeepers' category, 47.06 per cent had more than 7 members in the family while 41.18 per cent had 5-7 members in the family. The average number of beekeepers in small medium and large beekeepers categories was 5.32, 6.42 and 7.18, respectively.

The forgoing discussion indicates the positive relationship between family size and number of bee colonies. The probable reason for this was that large sized apiary needed more labour and time so the individual from large family size can devote more time as load of other household works is distributed to other members in the family.

5.1.1.5 Family composition of the beekeeper households

Family composition refers to the classifications of family members on the basis of gender, age, relationship to head etc. It helps to determine the requirement of basic necessities and available workforce for farm household. Family composition of beekeepers on the basis on gender and age has been presented in Table 5.5. The table clearly depicts that on aggregate level the number of female members in a family was 2.65 which was 42.20 per cent to the average family size while proportion of male population was 57.80 per cent. Highest proportion of 17.51 per cent and 13.38 per cent of average male and female members, respectively in a family belongs to young age group followed by middle age group. The number of females on an average in children and old age group was 0.55 and 0.43 with proportion of 8.75 and 6.90 per cent to the average family size at aggregate level. This indicates that on overall basis maximum proportion of both male and female was of working age.

Further observed that among the categories on an average proportion of male population (58.27 per cent) in a family was higher in case of small beekeepers. Male population proportion was decreased with increase in apiary size and reverse trend was seen for female population. Further observed that proportion of children in the family was decreasing from small to large beekeeper category while proportion of old members in the family increases with increase in apiary size. Further investigation revealed that highest proportion of both male and female members in a family belonged to young age group in case of both medium and large beekeepers' category. The result of the table shows large beekeepers had more working age members than other categories.

Table 5.5: Family composition of beekeeper households in the Nainital District

(Numbers/HH)

Beekeepers category	Age Group								Average family members		
	Children (0-14yrs)		Young (15-30yrs)		Middle age (31-50yrs)		Old Above (50 yrs)				
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total
Small beekeepers	0.74 (13.91)	0.53 (9.96)	0.79 (14.85)	0.53 (9.96)	1.05 (19.80)	0.84 (15.79)	0.52 (9.80)	0.32 (6.20)	3.10 (58.27)	2.22 (41.73)	5.32 (100.00)
Medium beekeepers	0.79 (12.34)	0.58 (9.09)	1.2 (18.83)	0.96 (14.94)	1.00 (15.58)	0.75 (11.69)	0.71 (11.04)	0.42 (6.49)	3.71 (57.79)	2.71 (42.21)	6.42 (100.00)
Large beekeepers	0.76 (10.66)	0.53 (7.38)	1.29 (18.03)	1.00 (13.93)	1.24 (17.21)	0.94 (13.11)	0.82 (11.48)	0.59 (8.20)	4.11 (57.32)	3.06 (42.68)	7.17 (100.00)
Overall	0.77 (12.20)	0.55 (8.75)	1.10 (17.51)	0.84 (13.38)	1.08 (17.24)	0.83 (13.26)	0.68 (10.68)	0.43 (6.90)	3.63 (57.80)	2.65 (42.20)	6.28 (100.00)

Figures in the parentheses indicate percentage to total

5.1.1.6 Educational level of the beekeepers

Education level is measured through calculating the extent of number of years an individual got formal education. Literacy level refers to the ability of an individual to read and write. Level of formal education indicates the capability of an individual to relate himself with the surrounding environment and understand the ongoing activities. It also increases awareness, decision making and desire to adopt the new technologies more easily and quickly than uneducated one. Considering the enormous importance of education in the day-to-day activities of an individual, the educational level of beekeepers was analyzed and the result has been presented in Table 5.6.

Table 5.6: Education level-wise distribution of beekeepers in Nainital district

(In Number)

Beekeepers Category	Education level group					Average Schooling (Years)
	Up to junior high school	High School	Intermediate	Graduation and above	Total	
Small beekeepers	4 (21.05)	9 (47.37)	5 (26.32)	1 (5.26)	19 (100.00)	10.37
Medium beekeepers	4 (16.67)	9 (37.50)	10 (41.67)	1 (4.17)	24 (100.00)	10.63
Large beekeepers	4 (23.53)	5 (29.41)	6 (35.29)	2 (11.76)	17 (100.00)	10.82
Overall	12 (20.00)	23 (38.33)	21 (35.00)	4 (6.67)	60 (100.00)	10.60

Figures in the parentheses indicate percentage to total

The table clearly indicates that on overall basis average formal education level of beekeepers was 10.60 schooling years. Maximum (38.33 per cent) beekeepers out of total 60 beekeepers were educated up to high school level followed by 35 per cent of beekeepers up to intermediate level. Only 6.67 per cent of beekeepers were graduated.

On analysis of the data in relation to different categories it was revealed that the average education level (schooling years) increases with increase in number of beehives owned. It might be possible that higher education level increases bee hive management skills of an individual and increases the adoptive level of individual. On further analysis it was observed that number of beekeepers attaining education level up to primary level were negligible among all categories while achieving education up to junior high school level were same in all categories, but proportion was different i.e. 21.05 per cent, 16.67 per cent and 23.53 per cent for small, medium and large beekeepers, respectively. Maximum

proportions i.e. 47.37 per cent of small beekeepers were educated up to high school while highest share of medium and large beekeepers had education up to intermediate level. In addition to this it was found that maximum graduated beekeepers belonged to large beekeepers' category which was about 11.76 per cent.

This shows the low level of education among beekeepers which may result in lower adoption of new technology on beekeeping forms.

5.1.1.7 Cropping pattern followed by beekeepers

Cropping pattern refers to the proportion of area under various crops at a point of time in a unit area. Table 5.7 represents the cropping pattern followed by honey producers in the study area.

A perusal of table illustrates that in the study area there are three distinct seasons to grow the crops viz. *Kharif (*July to October), *Rabi* (October to March) and *Zaid* (April to June). Further the table depicts that at aggregate level total gross cropped area during agricultural year 2017-18 was 2.84 acre and cropping intensity was 246 per cent on beekeepers' farms. In *Kharif* season main crop grown was paddy, which covered an area of 0.57 acre with the proportion of 20.07 per cent of total gross cropped area followed by 10.21 per cent proportion of other cereal crops like maize, finger millet etc. On further analysis it was noted that wheat, onion, strawberry, potato, barley, garlic, mustard, pea and lentil were the main *Rabi* season crops grown in the study area. It was found that the wheat dominantly covered 31.33 per cent of area of total cropped area in the season followed by fodder crops with 3.17 per cent area. In *Zaid* season vegetables crops like cucumber, buckwheat, raddish, etc. were mainly grown and covering about 15.85 per cent area out of the total grossed cropped area followed by 3.17 per cent of fodder crops. Potato was grown in both *Rabi* and *Kharif* seasons as agro-climatic conditions favour it to grow. It was found that fodder crops were taken in all three seasons primarily to feed livestock the whole year.

Category-wise analysis reveals that proportion of total cropped area and net cropped to the grossed cropped area was maximum in case of large and medium beekeepers, respectively, while cropping intensity was maximum for small beekeepers' farms. It was also observed that among *Kharif and Rabi* crops, area covered and contribution to total gross cropped area under cereals and fodder crops increased with increase in hive size while area cover under vegetables and pulses decreased with increase in apiary size.

Table 5.7: Cropping pattern followed by beekeepers in Nainital district

(Acre/Beekeeper household)

Crops	Beekeepers Category			
	Small beekeepers	Medium beekeepers	Large beekeepers	Overall
Kharif				
Paddy	0.31 (15.74)	0.52 (20.31)	0.97 (22.99)	0.57 (20.07)
Other cereals	0.16 (8.12)	0.29 (11.33)	0.42 (9.95)	0.29 (10.21)
Vegetables	0.17 (8.63)	0.08 (3.13)	0.13 (3.08)	0.11 (3.87)
Pulses	0.14 (7.11)	0.12 (4.69)	0.07 (1.67)	0.12 (4.23)
Fodder	0.02 (1.02)	0.05 (1.95)	0.11 (2.61)	0.06 (2.11)
Sub Total	0.77 (39.09)	1.06 (41.41)	1.70 (40.28)	1.15 (40.49)
Rabi				
Wheat	0.44 (22.33)	0.85 (33.20)	1.44 (34.12)	0.89 (31.33)
Vegetables	0.13 (6.60)	0.07 (2.73)	0.07 (1.67)	0.09 (3.17)
Pulses	0.03 (1.52)	0.02 (0.78)	0.03 (0.71)	0.03 (1.06)
Fodder	0.06 (3.04)	0.08 (3.12)	0.14 (3.31)	0.09 (3.17)
Other crops	0.10 (5.07)	0.06 (2.34)	0.01 (0.23)	0.05 (2.11)
Sub Total	0.77 (39.09)	1.06 (41.41)	1.70 (40.28)	1.15 (40.49)
Zaid				
Fodder	0.06 (3.04)	0.08 (3.12)	0.14 (3.31)	0.09 (3.17)
Vegetables	0.37 (18.78)	0.36 (14.06)	0.68 (16.11)	0.45 (15.85)
Sub Total	0.43 (21.83)	0.44 (17.19)	0.82 (19.43)	0.54 (19.01)
Total cropped area	1.00 (50.76)	1.43 (55.86)	2.45 (58.05)	1.57 (56.63)
Net cropped area	0.77 (39.09)	1.06 (41.41)	1.70 (40.28)	1.15 (40.49)
Gross cropped area	1.97 (100.00)	2.56 (100.00)	4.22 (100.00)	2.84 (100.00)
Cropping intensity (%)	256	241	248	246

Figures in the parentheses indicate percentage to total

Area under horticulture crops not included in net cropped area

5.1.1.8 Sources of income of the beekeepers.

The beekeepers' household earned their income from different sources. The description of these sources has been presented in Table 5.8. At the first place it was revealed from the table that at aggregate level on an average beekeeper household earned Rs. 115000 from farm enterprises which was about 71.30 per cent out of total annual income of the household and rest was contributed from non-farm enterprises. Out of farm enterprises highest contribution was from beekeeping about 23.43 per cent to the total income followed by income earned from hired-out orchards. Lowest proportion was of poultry only 4.96 per cent. In addition to this, annual income from crop and livestock production was Rs. 21900 and Rs. 15300, respectively. On analysis of non-farm enterprises it was observed that highest share of 14.26 per cent was contributed to the total income by business and shops followed by contribution of 11.84 per cent from salaries and wages. Other sources of income contribute about Rs. 4200 per annum.

Table 5.8: Sources of income of beekeepers in Nainital district

(Rupees per beekeeper)

Sources of income	Beekeepers Category			
	Small beekeepers	Medium Beekeepers	Large beekeepers	Overall
Farm enterprises				
Beekeeping	20000 (16.95)	39700 (24.31)	55000 (26.63)	37800 (23.43)
Crop production	16000 (13.51)	19300 (11.82)	32000 (15.50)	21900 (13.58)
Livestock production	12500 (10.56)	16000 (9.80)	17500 (8.47)	15300 (9.49)
Poultry	7200 (6.08)	8800 (5.39)	7600 (3.68)	8000 (4.96)
Hired out orchards	15300 (12.92)	32600 (19.96)	50000 (24.21)	32100 (19.90)
Sub total	71000 (60.00)	116400 (71.28)	162100 (78.49)	115000 (71.30)
Nonfarm enterprises				
Salaries and wages	19900 (16.81)	18700 (11.45)	18900 (9.15)	19100 (11.84)
Business/shop	21000 (17.74)	24700 (15.13)	23000 (11.14)	23000 (14.26)
Others	6500 (5.49)	3500 (2.14)	2500 (1.21)	4200 (2.60)
Sub total	47400 (40.00)	46900 (28.72)	44400 (21.50)	46300 (28.70)
Total	118400 (100)	163300 (100)	206500 (100)	161300 (100)

Figures in the parentheses indicate percentage to total
Values are round off to 10^{th} digit

Further the table portrayed that the proportion of income from farm enterprises increased with the increase in the size of beekeeping practices. It was observed that within farm enterprises in relation to categories of beekeeper, the large beekeepers earned more than half of their income from combination of beekeeping and hired out orchards. Across categories crop production contributed highest share to income in case of large beekeeper followed by small beekeepers and medium beekeepers. It shows advantage of large farm size in case of large beekeepers and advantage of crop diversification in case of small beekeepers. In case of income from livestock and poultry, small beekeepers earned highest proportion of 10.56 per cent and 6.08 per cent of income, respectively followed by medium beekeepers. It shows that income from livestock and poultry decreases with increase in apiary size.

The proportion of income contributed from all non-farm enterprises across categories of beekeepers was highest in case of small beekeepers followed by medium beekeepers and proportion was minimum for large beekeepers category. This indicates that income from non-farm enterprises decreases with increase in hive size owned by beekeepers.

5.1.1.9 Livestock and poultry population of the beekeepers

Rearing of livestock and poultry birds is important agriculture allied activities which strengthen the economics of farm household in rural areas. It plays important role to meet out daily basis need of the farm household. On looking up the importance, the number of livestock and poultry birds owned by beekeeper households has been presented in Table 5.9. At aggregate level beekeeper-households on an average had owned 4.15 livestock and 82.5 poultry birds. Out of total livestock population per household on an average cow population was 1.5 which was about 36.14 per cent, it was followed by population of young stock which had proportion about 23.61 per cent. The population of she and he-buffalo on an average was 0.77 and 0.12 with share in total livestock population of 18.55 per cent and 2.89 per cent, respectively. The contribution of goat population was 0.14 per cent and bullock population was only 5.30 per cent out of total livestock population.

Further on analysis of the data related to beekeeping categories, it was observed that on an average large beekeepers had 4.74 livestock population which was highest among all categories followed by small beekeepers and medium beekeepers. Further on analysis it was revealed that on an average bullock and he buffaloes population was 0.42 and 0.21 with proportion of 10.50 per cent and 5.25 per cent, respectively in case of small beekeeper while only 0.06 population of each in case of large beekeepers, and medium beekeepers had population of bullock and he buffaloes somewhere between small and large beekeepers. This scenario shows significance of bullock and he-buffaloes for use in field activities for crop

production particularly on small beekeepers' farms. The cow and she-buffaloes together contribute more than 50 per cent of the total livestock population in case of small beekeepers' categories. The large beekeepers had highest population of milch livestock whereas medium and small beekeepers had lowest milch animal population in the area.

Table 5.9: Livestock and poultry birds' population in beekeepers household in Nainital district

(Number/Beekeeper)

Livestock category	Beekeepers Category			
	Small beekeepers	Medium beekeepers	Large beekeepers	Overall
Bullock	0.42 (10.50)	0.17 (4.44)	0.06 (1.27)	0.22 (5.30)
She-buffaloes	0.53 (13.25)	0.67 (17.49)	1.18 (24.89)	0.77 (18.55)
Cow	1.15 (28.75)	1.5 (39.16)	1.88 (39.66)	1.5 (36.14)
He-buffaloes	0.21 (5.25)	0.08 (0.21)	0.06 (1.27)	0.12 (2.89)
Goat	1.05 (26.25)	0.17 (4.44)	0.59 (12.45)	0.57 (0.14)
Young stock (cow & buffaloes) Age under 1.5 year	0.63 (15.25)	1.25 (32.64)	1.00 (21.10)	0.98 (23.61)
Total	4.00 (100.00)	3.83 (100.00)	4.74 (100.00)	4.15 (100.00)
Poultry (birds)	55.26	102.08	82.35	82.5

Figures in the parentheses indicate percentage to total

Goat and young stock population were maximum in small and medium beekeepers' categories with a proportion of 26.25 per cent and 32.63 per cent, respectively.

The poultry birds' population on beekeeping farms on an average was 102.08, 82.35 and 55.26 in case of medium, large, and small beekeepers.

These results imply that beekeepers had maintained a good population of livestock in the study area.

5.1.1.10 Investment on bee colony, beehives and equipments

Investment is the cost incurred in setting-up of an enterprise. The investment in beekeeping is influenced by the apiary size and availability of total funds with beekeepers. An investment on different beekeeping items for different categories of beekeepers has been presented in the Table 5.10. The overall investment at aggregate level for an apiary was Rs. 252982. The bee colony and beehives together contributed highest share (81.16 per cent) of the total investment at aggregate level. Out of this, investment on bee colony was nearly half of the

total investment on enterprise. It was 40.62 per cent in case of small beekeepers, 41.62 per cent in medium beekeepers and 43.34 per cent in large beekeepers. Items like smoker, bee veil, honey extractor and jute bag constituted very less proportion (less than 5.00 per cent) of total investment. Same trends were followed among different categories. It can be seen in the table that the investment on small, medium and large apiary was to the tune of Rs. 116366 Rs. 242787 and Rs. 420063, respectively.

Table 5.10: Investment on bee colony, beehives and equipments in Nainital district

(Rupees per Beekeeper)

Particulars Items	Beekeepers category			
	Small beekeepers	Medium beekeepers	Large beekeepers	Overall
Beehive	47368 (40.71)	94450 (38.90)	160711 (38.26)	98315 (38.86)
Stand	5673 (4.88)	14963 (6.16)	26234 (6.25)	15214 (6.01)
Honey extractor	2247 (1.93)	5069 (2.09)	5259 (1.25)	4229 (1.67)
Transportation net	721 (0.62)	1302 (0.54)	1848 (0.44)	1273 (0.50)
Honey extraction net	696 (.60)	1041 (0.43)	1217 (0.29)	981 (0.39)
Bee veil	318 (0.27)	362 (0.15)	405 (0.10)	360 (0.14)
Gloves	191 (0.16)	201 (0.08)	190 (0.05)	195 (0.08)
Smoker	188 (0.16)	235 (0.10)	387 (0.09)	263 (0.10)
Swarming bag	109 (0.09)	130 (0.05)	198 (0.05)	143 (0.06)
Queen cage	387 (0.33)	1473 (0.61)	612 (0.15)	885 (0.35)
Uncapped knife	26 (0.02)	28 (0.01)	42 (0.01)	32 (0.01)
Jute bag	473 (0.41)	1010 (0.42)	1941 (0.46)	1104 (0.44)
Feeder	3331 (2.86)	6931 (2.85)	12744 (3.03)	7438 (2.94)
Bee colony	47263 (40.62)	101042 (41.62)	182059 (43.34)	106967 (42.28)
Comb foundation sheet	7373 (6.34)	14550 (5.99	26216 (6.24)	15583 (6.16)
Total	116366 (100.00)	242787 (100.00)	420063 (100.00)	252982 (100.00)

Figures in the parentheses indicate percentage to total

5.1.1.11 Beekeeping experience of beekeepers

Beekeeping experience refers to the number of years an individual has practiced beekeeping. It is used to measure understanding and competence level of the beekeeper. It is supposed that experience leads to enhanced skills and better management of the beekeeping enterprises.

The beekeepers were divided into different groups on the basis number of years they practiced beekeeping. Table 5.11 shows the distribution of beekeepers on the basis of beekeepers experience. The table illustrates that at aggregate level the average experience to practice beekeeping was 11.15 years. Out of total 60 beekeepers, 29 beekeepers accounting for 48.33 per cent were practicing beekeeping from 9 to 15 years. The proportion of beekeepers to the total beekeepers with beekeeping experience more than 15 years was 23.33 per cent while 28.33 per cent had less than 8 years' experience.

Table 5.11: Distribution of beekeepers on the basis of beekeeping experience in Nainital district

(In number)

Beekeepers Category	Beekeeping Experience Group				Average (years)
	Up to 8yrs	9-15 yrs	Above 15yrs	Total	
Small beekeepers	9 (47.37)	7 (36.84)	3 (15.79)	19 (100.00)	7.89
Medium beekeepers	6 (25.00)	10 (41.67)	8 (33.33)	24 (100.00)	12
Large beekeepers	2 (11.76)	12 (70.59)	3 (17.65)	17 (100.00)	13.59
Overall	17 (28.33)	29 (48.33)	14 (23.33)	60 (100.00)	11.15

Figures in the parentheses indicate percentage to total

Among different categories of beekeepers on analysis it was observed that average beekeeping experience for small, medium and large categories was 7.89, 12 and 13.59 years. It shows the tendency of beekeepers to increase their hive size after gaining proper experience and the reason for this was that to manage the large size apiary more experience was needed. It was further revealed that medium beekeepers had highest proportion of beekeepers (41.67 per cent) with beekeeping experience of 9 to 15 years while small beekeepers category had maximum proportion of 47.37 per cent of beekeepers with beekeeping experience of less than 8 years. As high as 70.59 per cent of beekeepers in

large category had been practicing beekeeping for 9-15 years. It was revealed from the results that beekeepers in the study area had high experience with good technical knowledge.

5.1.1.12 Training programmes attended by beekeepers

For running any enterprise successfully proper technical know-how about the activities of enterprises must be known to the entrepreneur. To acquire the relative and necessary knowledge to operate enterprise individuals must be given trainings on beekeeping.

In the area it was observed that beekeepers attended several trainings organized by different agencies like Rajkiya Moan Palan Kendra (RMPK), Khadi Village Industries Commission (KVIC), and National Bee Board (NBB). The distribution of beekeepers on the basis of number of training attended by them is given in the Table 5.12.

A perusal of table portrayed that across categories of beekeepers, medium beekeepers on an average had attended highest number of trainings i.e. 3.71 followed by large beekeepers (3.59) and small beekeepers (2.74). Maximum numbers of beekeepers from each category were found attending 3-4 training programmes. Accordingly, on an average beekeepers attended 3.37 training programmes. These results depict that beekeepers were well trained, acquired good technical know-how about beekeeping and were well connected with different agencies which provide extension services in the area.

Table 5.12: Distribution of beekeepers on the basis of training programme attended in Nainital district

(In Number)

Beekeepers Category	Training Attended Group				Average
	Up to 2	3-4	Above 4	Total	
Small beekeepers	7 (36.84)	10 (52.63)	2 (10.53)	19 (100.00)	2.74
Medium beekeepers	5 (20.83)	15 (62.50)	4 (16.67)	24 (100.00)	3.71
Large beekeepers	3 (17.65)	10 (58.82)	4 (23.53)	17 (100.00)	3.59
Overall	15 (25.00)	35 (58.33)	10 (16.67)	60 (100.00)	3.37

Figures in the parentheses indicate percentage to total

5.1.2 Ongoing beekeeping practices

Beekeeping has been practiced in the study area for a long time and in the recent past popularity of beekeeping as an income generating activity has been on rise among rural population. Beekeeping is usually practiced as a subsidiary enterprise to agriculture and allied activities. However, none of the beekeepers in the area completely base their livelihood only on beekeeping activities. Coupled with advancement and adoption of technology by respondents, the beekeeping practice in the area is undertaken in two types of beehives viz. traditional and modern movable frame hives. In investigation it was found that some of beekeepers had reared bees in traditional beehives such as net hive, wall hive and log hives. These hives are fixed comb type because the combs are attached to the top and sides of the hive itself and the beekeeper cannot remove and replace them. In some traditional hives only one end of the hive could be opened. The bee species *Apis cerena* was reared in these traditional hives.

In modern movable frame (Langstroth) beehives, *Apis mellifera* and *Apis cerena* both were reared. Modern movable-frame hive consists of precisely made rectangular box hives (hive bodies) with the movable frame. It was reported by beekeepers that in one beehive on an average eight movable frame were placed. The range of the number of frames per hive varies from 6-10 frames based on the strength of colony. The number of hives owned by beekeepers vary seasonally according to the population size of bees and it increases as the bee population increases and decreases likewise. Movable frame hives allow appropriate colony management and use of a higher-level technology, with larger colonies, and can give higher yield and quality honey. The super box was an additional attachment to the single brood box when population was increased. It has two enclosed chambers.

Number of different types of beehives owned by beekeepers has been presented in Table 5.13. A perusal of the table depicts that on an average at overall level average number of colonized beehives was 108.92 out of which 102.38 was of single boxes which was about 94 per cent to the total followed by super boxes with proportion of 4.20 per cent. The probable reason for a greater number of single boxes was that it acquired less space and was easy to handle and carry during transportation. Another reason was that single boxes were cheaper than super boxes. The number of traditional hives on an average was 0.86 with proportion of only 0.79 per cent. Further the table depicts that the average number of modern beehives (Meliferra+Cerena) was 48.30, 102.33 and 182.93 in case of small medium and large beekeepers, respectively. On an average, 108.06 modern beehives

per beekeeper were operated. Further, the table depicts that the number of traditional boxes (0.96) was higher in case of medium beekeepers but the proportion to the boxes owned (1.47 %) was higher in small beekeepers category.

These results indicate that beekeepers were highly engaged in modern beekeeping activity and traditional beekeeping was practiced on a small scale.

Table 5.13: Number of different type of beehives owned by beekeepers.

(Numbers/ beekeepers)

Type of Beehives	Beekeepers Category			
	Small beekeepers	**Medium beekeepers**	**Large beekeepers**	**Overall**
Modern Beehives				
Single box (mellifera)	45.84 (84.31)	96.63 (93.55)	173.71 (94.38)	102.38 (94.00)
Single box (cerena)	1.04 (1.91)	1.29 (1.25)	0.87 (0.47)	1.09 (1.00)
Super box (mellifera)	1.42 (2.61)	4.42 (4.28)	8.35 (4.55)	4.58 (4.20)
Sub Total	48.30 (86.92)	102.33 (97.82)	182.93 (99.10)	108.06 (98.21)
Traditional beehives				
Log hive, wall hive, etc.	0.80 (1.47)	0.96 (0.93)	0.78 (0.42)	0.86 (0.79)
Total	49.10 (100.00)	103.29 (100.00)	183.71 (100.00)	108.92 (100.00)

Figures in the parentheses indicate percentage to total

5.1.2.2 Placement of beehives and seasonal management

Placement of beehives mainly depends on the type of hive and species reared in the hive. The beekeepers of the study area generally placed their traditional beehives in the backyards of house, walls and corners of the house. In addition to this, hives were also placed in the hole or space prepared in the walls of house for the rearing bees.

In case of modern beehives, beekeepers placed their beehives in any floral crop field. The *Apis cerena*`s modern hives were placed by beekeepers on the field edges, nearer to the forest boundary in the flora rich places near to the house and locality. The mellifera beehives were placed by beekeepers in the forest and floral rich locality. In search of abundant bee flora to the bees, beekeepers usually shift their mellifera beehives to different places in different districts and states following a proper migratory route**.**

5.1.2.3 Migratory routes followed by the beekeepers

There were 10 migratory routes which were followed by the beekeepers. d beekeepers visited different places, within state and outside state to exploit different floral resources available there. Here is a description of migratory routes with respect to major destinations (district headquarters) they used to place their bee colonies for flora.

District wise descriptions of migratory routes followed by beekeepers is given below.

A. Intra state

Route I - Nainital ⇨ Badaun ⇨ Bareilly ⇨ Nainital

B. Inter state

Route II - Nainital ⇨ Badaun ⇨ Bareilly ⇨ Nainital

Route III - Nainital ⇨ Sambhal ⇨ Moradabad ⇨ U.S. Nagar ⇨ Nainital

Route IV Nainital ⇨ Sambhal ⇨ Rampur ⇨ Moradabad ⇨ U.S. Nagar ⇨ Nainital

Route V Nainital ⇨ Badaun ⇨ Bareilly ⇨ U.S. Nagar ⇨ Nainital

Route VI Nainital ⇨ Sambhal ⇨ Moradabad ⇨ Rampur ⇨ Nainital

RouteVII Nainital ⇨ Sambhal ⇨ Aligarh ⇨ Bharatpur ⇨ Moradabad ⇨ Nainital

Route VIII Nainital ⇨ Badaun ⇨ Bharatpur ⇨ Bareilly ⇨ Nainital

Route IX Nainital ⇨ Dausa ⇨ Rampur ⇨ Nainital

Route X Nainital ⇨ Sambhal ⇨ Bharatpur ⇨ Rampur ⇨ Moradabad ⇨ Nainital

Beekeepers mainly followed two types of the route viz. intra and inter-state. In case of intra-state beekeepers followed several routes confined within the districts of native state while in inter-state the routes went beyond the boundaries of the state. The migration route was started in the months of June-July. The month-wise calendar of beekeepers movement in the search of rich flora is provided in Table 5.14. The table clearly depicts that the beekeepers migrate to the Sambhal and Badaun during July-September for the pollens of maize and pearl millet crops. The beekeepers following inter-state route were dependent upon Finger millet and Maize crops for pollen. In September and October, beekeepers went to Bareilly, Chandausi, Bharatpur and Dausa for the flora of mustard and rapeseed crops. Out of these districts first two were district of Uttar Pradesh and latter two belongs to Rajasthan state. Eucalyptus along with mustard flora exploited by beekeepers from February to mid fortnight of March in Rampur and Moradabad districts of Uttar Pradesh. Meanwhile in March they migrated to U.S. Nagar and Nainital districts of Uttarakhand and here forest and litchi flora was utilized by them.

Further the description about the number of beekeepers following a particular migratory route and the average number of migrations is given in the table 5.15. On overall analysis it was observed that average number of migrations practiced by beekeepers was 6.10 and average distance covered was 613 km. Among all the routes maximum average distance (968 km) was covered in migratory route VII while minimum average distance was covered in migratory route I, only 85 Km. Maximum number of migrations were undertaken by beekeepers that were followed migratory route X. In context to number of beekeepers following the migratory route, route VIII was highly adopted route followed by 10 beekeepers. Next to it was route II which was followed by 8 beekeepers out of total 60 beekeepers.

Further the table clearly depicts that among categories the average number of migration in small, medium and large beekeepers categories was 5, 6.63 and 6.59, respectively. It indicates that maximum migration was followed by medium beekeepers and least by small beekeepers. The Maximum average distance covered was 689 Km which was observed in case of large beekeepers followed by medium beekeepers. It shows that average distance covered in a migratory route increases with increase in apiary size. The longest route was route VII in all beekeepers categories. Only 5 beekeepers followed inter-state route and all belonged to small beekeepers category. It was also observed that beekeepers followed the same route, but the distance covered and number of migration were different in many routes and the reason for it might be that the beekeepers migrated together in the long route but in native districts they followed migrations different from each other.

5.14 Area and season -wise floral crops description

Season	Area visited	Crop
Mid January –February	Bharatpur, Kashipur, Moradabad, Jeolikote	Mustard, Rapeseed, Ber, Wheat+ Mustard, Eucalyptus
March –April	Thakurdwara, Bilaspur, Rampur, Ramnagar, Tanda Jungle, Jeolikote, Kaladhungi, Gaushala	Litchi, Bottle brush, Sesamum, Eucalyptus,
May-June	Gaushala, Golapaar, Dhanachuli, Ramgarh, Jeolikote	Apple, Jamun, Oak and Vegetables
July –September	Jeolikot, Badaun, Sambhal, Chandusi, Bareily,Golapaar, Bharatpur	Maize, Pearl Millet, Finger Millet, Grass
October –mid January	Bharatpur, Bareily, Baheri, Dosa, Badaun	Rapeseed, Mustard, Padam, Berseem

Table 5.15: Migratory route and average number of migration undertaken by beekeepers

	Small beekeepers			Medium beekeepers			Large beekeepers			Overall		
Route	**Beekeepers followed**	**Avg. Migration**	**Avg. Distance covered (Km)**	**Beekeepers followed**	**Avg. migration**	**Avg. Distance covered (Km)**	**Beekeepers followed**	**Avg. migration**	**Avg. Distance covered (Km)**	**Beekeepers followed**	**Avg. migration**	**Avg. Distance covered (Km)**
I	5	2	85	-	-	-	-	-	-	5	2.00	85
II	3	5.67	596	3	6	625	2	6.5	615	8	6.00	611
III	2	5.5	330	2	6	370	1	7	395	5	6.00	359
IV	0	0	355	4	6.25	395	2	6.5	395	6	6.33	395
V	2	5.5	412	2	6.5	477	3	6.67	490	7	6.29	464
VI	1	6	338	2	7.5	398	-	-	-	3	7.00	378
VII	1	7	974	3	7	965	1	7	970	5	7.00	968
VIII	2	6.5	795	5	6.4	780	3	6.33	790	10	6.40	785
IX	2	6.5	850	-	-	-	2	6.5	850	4	6.50	850
X	1	7	812	3	7.67	835	3	6.67	810	7	7.15	821
Average	1.9	5	498	2.4	6.63	650	1.7	6.59	689	60	6.10	613

5.1.2.4 Seasonal management of the bee colonies

It was reported that beekeepers did not provide any specific management to the traditional beehives except for their protection from rain and ants as bees themselves manage their hives. In case of modern beehives proper management and care to the bee colonies was provided by the beekeepers to the bee colonies to avoid the damage of bee colonies. It was reported by beekeepers that rainy season was the most destructive period for the bees and intensive care was needed during this period. Beekeepers regularly inspected their boxes and proper cleaning was done to maintain the bee colonies healthy. The beekeepers practiced spray of Formalin (40 per cent), Oxalic Acid, Thiamol syrup and cow urine on bee colonies hive boxes and equipments to avoid infestation of diseases like European foul brood, Thai sac brood and Mite generated diseases as these sprays sanitize them from bacterial and fungal infection. The medicine teramycin (250-400 mg in 5 litres of sugar syrup), and dusting of Sulphur was also sprayed by beekeepers.

It was also reported that during lean or dearth period, beekeepers provides the supplement feed from the month of May to October to maintain the strength of bee colonies and avoid swarming. The pollen cake, protein and sugar syrup have been recommended as supplement feed but in the study area only sugar syrup was provided by the beekeepers. The reason for it was that pollen was collected by bee themselves from relevant crops like maize, pearl millet, finger millet etc. The sugar syrup in quantity of about 400-500 millilitre per hive per week was provided by beekeepers in 1:1 proportion of sugar and water in summer season, while in winter season the proportion of sugar was doubled and syrup was provided in 2:1 proportion. During dearth period on an average 11.61 kg sugar per hive was required to prepare sugar syrup. In addition to these beekeepers spent Rs. 1320 per hive on medicines. The beekeepers also reported that *Apis cerena-indica* had more resistance to extreme weather conditions and diseases while *Apis mellifera* was more susceptible.

5.1.2.5 Sources of bee hives, bee colonies and beekeeping equipments.

There are several beekeeping equipments which are required to practice beekeeping activities. These equipments are bee hive boxes, bee veil, gloves, uncapping knife, honey extractor, feeder, queen cage, smoker, bee stand and swarming bag. On investigation, it was observed that the beekeepers utilized the locally made equipments for performing beekeeping activities.

On investigation it was reported that beekeepers utilized the beehive boxes made up of mango, eucalyptus and toon wood etc. Although the beehives made up of Mango wood was cheapest among them but beekeepers mostly used bee boxes made up of eucalyptus wood. Probable reason for this was moderate cost and easy availability of eucalyptus wood boxes. The toon wood's beehive boxes were utilized only by a few beekeepers even though Toon wood is more durable than others. Second most important equipment for beekeeping was honey extractor. It was revealed from investigation that all beekeepers used locally made 4 frame honey extractors. None of the beekeepers used the standard stainless-steel honey extractor.

In respect of bee colonies, in general beekeepers raised their own colonies. If required they purchased bee colonies from fellow beekeepers. Sometimes they also got colonies from Government institutions.

While investigating about sources of these equipments it was revealed by beekeepers that there were various government and non-government sources from which beekeepers get the beehive boxes, colonies and equipments. Khadi Village Industries Commission (KVIC) and Rajkiya Moan Palan Kendra (RMPK) were two prominent government organizations which provided the bee hive boxes with colonies to the beekeepers under government schemes to support and enhance beekeeping in study area. Beekeeping equipments and boxes were also available in local Ramnagar and Haldwani markets. In addition to this, it was also reported by beekeepers that some honey traders and processors also provide bee boxes and beekeeping equipments to the beekeepers. While some of the beekeepers purchased bee boxes from Badaun, Saharanpur and Rampur as these places were hubs of eucalyptus and due to this much cheaper boxes were available there.

5.1.2.6 Production of bee products

Beekeeping industry is mainly based on honey production. The amount of honey produced from one beehive per year varies from place to place which in most cases is determined by the availability of plenty pollen and nectar source plants and the level of management. On investigation, it was revealed that beekeepers produced honey from different flora, which was abundant in areas where beehives were placed. In this manner, the beekeepers produced honey from mustard, litchi, forest trees, eucalyptus and other floral crops. The honey produced from mustard was viscous due to incorporation of pollen while the honey of litchi and forest was liquid in form.

The beekeepers reported about the number of times they harvest honey in a year. The number of times honey harvested in a year by the beekeepers is given in Table 5.16. The table showed that at aggregate level frequency of harvest honey on an average was 6.50 times. Out of 60 beekeepers 65 per cent harvested honey 5-7 times. About one-fourth of the beekeepers harvested honey more than seven times in a year while only 11.67 per cent of beekeepers harvested honey up to four times.

Among beekeepers categories, medium beekeepers on the average harvested honey maximum times while the number of times honey harvested was lowest for small beekeepers (5.42 times). The number of beekeepers, who harvested honey upto 4 times, was same (i.e. only one) for medium and large beekeepers, but there were five small beekeepers who harvested honey upto 4 times. These results indicated that the efficiency of medium beekeepers to harvest honey was more.

Table 5.16: Distribution of beekeepers as per the number of times honey harvested in a year in Nainital district

(In Number)

Beekeepers Category	Honey Harvest Group				Average
	Upto 4	5-7	Above 7	Total	
Small beekeepers	5 (26.32)	12 (63.16)	2 (10.53)	19 (100.00)	5.42
Medium beekeepers	1 (4.17)	16 (66.67)	7 (29.17)	24 (100.00)	7.16
Large beekeepers	1 (5.88)	11 (64.70)	5 (29.41)	17 (100.00)	6.71
Overall	7 (11.67)	39 (65.00)	14 (23.33)	60 (100.00)	6.50

Figures in the parentheses indicate percentage to total

Table 5.17: Per annum production of bee products by the beekeepers in the Nainital district

Beekeepers Category	Bee Products		
	Honey (Kg)	Wax (Kg)	Bee colonies (No.)
Small beekeepers	820	7.09	7.68
Medium beekeepers	2097.92	24.25	25.89
Large beekeepers	3653.94	41.87	38.69
Overall beekeepers	2133.33	23.53	23.67

Figures in the parentheses indicate percentage to total

Table 5.17 presents the production of different bee products obtained by beekeepers in the area. On perusal of the table it was revealed that average production of honey for small, medium and large beekeepers was 820 kg, 2097.92 kg, and 3653.33 kg, respectively. On overall basis average production of honey per household was 2133.33 kg. Similarly, wax production per household was 23.53 kg and raised in bee colonies per year per household on an average was 23.67.

5.1.2.7 Storage, processing and marketing of honey

Storage provides time and space for the sale of produced commodity while processing provides value addition to the commodity.

On investigation, it was revealed that all beekeepers stored honey in local made tin containers and plastic bins with storage capacity of 22- 24 kg. It was also reported by beekeepers that few traders and processors also provided storage containers on the condition their produce would be disposed off through them. As the containers used by beekeepers were not scientifically standardized, the quality of raw honey stored in them deteriorates in few months so, beekeepers were not able to store honey for a long time. The retention power of beekeepers to store honey was also less. It was also stated by beekeepers that there was unavailability of proper storage containers in the study area.

Processing of raw honey was not practiced at large scale by the beekeepers. Only little amount of honey was strained, filtered and processed manually by traditional methods for their own consumption and to sell directly in retail to the consumers. Overall the beekeepers sold only 2.83 per cent of honey in processed form and rest 97.17 per cent in raw form. The traders and processors purchase only crude honey while consumers' purchase both raw and crude form honey from beekeepers.

The reason for this was high cost of mechanized processing equipment and it was not feasible to process large quantity of honey manually. In the same manner, beeswax was also sold by the beekeepers in crude form without processing.

As reported by the beekeepers there was door step market system in the study area. Processors and traders usually come to their place and purchase their produce. Beekeepers members of same group mostly sold their honey together. Most of the local consumers also visited their places to purchase required amount of honey. In addition to this, some beekeepers also practiced sale of honey in glassware on their respective shops. The price of liquid honey was more in comparison to viscous mustard honey. The demand for forest flora honey was more in the study area.

Beekeepers also reported that there were only a few traders and processors in the study area leading to low competition in the market and consequently the price of honey was determined by traders and processors while beekeepers were price-takers only.

5.1.2.8 Social group membership

On investigation it was reported by beekeepers that they practiced beekeeping in small groups. Out of the total 60 beekeepers 75 per cent of members formed their small groups. They share ideas and learn about benefits that positively contribute to the extent of honey produced and this can be explained by the fact that individuals in a group are easily influenced by their associates than those in isolation. They performed migration, selling of products and even shared their equipment. This provides them to pool their resources together and take advantage of economies of scale.

5.2 Cost of and return from honey production

The objective of any enterprise is to earn maximum returns with minimal cost. The quantum of profit depends upon optimum utilization of resources and proper management. In the present study cost of and returns from honey production has been calculated for the year 2017-18.

5.2.1 Cost structure of honey production

The cost has been divided into two components i.e. fixed and variable cost and observations have been taken for small, medium, and large beekeepers depending upon their size of operation. The components of fixed cost were depreciation value for equipments and amount of interest on the present value of fixed assets used in beekeeping and in addition to this fees for permission of forest land use right. The variable cost was computed by considering the value of variable resources used per hive and the interest on working capital. The Table 5.18 shows the parameters considered and items adapted for calculating the cost of honey production.

The table shows that on overall basis average total cost of honey production per hive was Rs. 1727.82. Out of which overall fixed and variable cost were Rs. 376.44 and Rs. 1351.36 which account for 21.79 per cent and 78.21 per cent of the total cost of honey production, respectively. This indicate higher proportion of variable cost to the total cost.

Among different beekeeping categories table depicts that total cost per hive for small, medium and large beekeepers was Rs. 1741.69, Rs. 1766.23 and Rs. 1693.69, respectively. The result suggests that larger beekeepers have incurred lowest cost per hive than others. This signifies that concept of economies of scale is involved in beekeeping business in the area.

Table 5.18: Cost structure per hive per household for the beekeepers in Nainital District

(Rupees/hive)

Cost Items		Beekeepers category			
		Small	Medium	Large	Overall
Fixed cost					
Forest land use right		7.06 (0.41)	5.84 (0.33)	6.25 (0.37)	6.20 (0.36)
Depreciation of fixed asset		225.49 (12.95)	210.96 (11.94)	214.55 (12.67)	214.72 (12.43)
Interest on fixed asset capital @ 10% p.a.		156.5 (8.99)	156.4 (8.86)	154.55 (9.13)	155.52 (9.00)
Total fixed cost		389.05 (22.34)	373.20 (21.13)	375.35 (22.15)	376.44 (21.79)
Variable cost					
Cost of foundation sheet		27.28 (1.57)	40.90 (2.26)	37.29 (2.20)	36.91 (2.14)
Cost of sugar syrup		454.82 (26.11)	447.86 (25.36)	400.37 (23.64)	425.93 (24.65)
Labour cost	Hired	81.24 (4.66)	95.67 (5.42)	112.52 (6.64)	101.78 (5.89)
	Family	273.55 (15.71)	230.18 (13.0)	182.04 (10.75)	213.03 (12.33)
	Sub total	354.79 (20.37)	325.80 (18.45)	294.56 (17.39)	314.81 (18.22)
Migration expense Transportation Site Land rent	Transportation	241.00 (13.84)	260.00 (14.72)	280.00 (16.53)	266.98 (15.45)
	Site rent	71.56 (4.19)	80.55 (4.56)	85.60 (5.05)	81.73 (4.73)
	Guard salary	60.52 (3.47)	71.65 (4.06)	88.06 (5.20)	78.00 (4.51)
	Travelling	24.00 (1.38)	20.35 (1.15)	19.00 (1.12)	20.20 (1.17)
	Accommodation	28.55 (1.64)	31.00 (1.76)	37.00 (2.18)	33.55 (1.94)
	Sub total	425.63 (24.44)	487.69 (27.61)	499.66 (29.50)	484.78 (28.06)
Honey storage container		1.31 (0.08)	0.55 (0.03)	0.40 (0.02)	0.59 (0.03)
Medicine		13.00 (0.75)	12.89 (0.73)	11.70 (0.69)	12.33 (0.71)
Miscellaneous and unforeseen expenses		10.00 (0.57)	10.00 (0.57)	10.00 (0.59)	10.00 (0.58)
Interest on working capital @ 10 % for six months		65.81 (3.78)	68.19 (3.86)	64.36 (3.80)	66.01 (3.82)
Total variable cost		1352.64 (77.66)	1393.03 (78.87)	1318.34 (77.85)	1351.36 (78.21)
Total cost		1741.69 (100.00)	1766.23 (100.00)	1693.69 (100.00)	1727.82 (100.00)
Total production (kg)		17.35	20.76	20.06	19.95
Cost of production of honey (Rs./kg)		90.61	72.78	73.62	75.36
Cost of production of wax (Rs./kg)		244.83	216.36	223.13	226.19
Cost of raising a unit of bee colony frame		101.69	99.17	97.24	99.47

Figures in the parentheses indicate percentage to total

The total fixed cost incurred per hive in the case of small, medium and large beekeepers was Rs. 389.05, Rs. 373.20 and Rs. 375.35 contributing 22.34 per cent,

21.13 per cent and 22.15 per cent of the total cost, respectively. It shows that fixed cost per hive was higher for small apiary followed by large apiary whereas minimum for medium apiary. The major reason for this cost difference was misallocation and underutilization of the resources resulting in advantage for the medium and large beekeepers over the small beekeepers. Additionally, most of the small apiaries had bought costlier items than the medium and large beekeepers which resulted in higher depreciation and higher present value. It was also found during investigation that the medium and large beekeepers have even utilized the equipment after the completion of their average expected life. Thus, the depreciation and present value of that equipment was negligible. It was more frequent in the case of medium beekeepers that resulted in lowest annual depreciation.

The variable cost incurred in running an apiary were migration expenses, comb foundation sheets, sugar syrup, medicines, labour, miscellaneous expenses etc. The variable cost for small, medium and large apiary was estimated to be Rs. 1352.64, Rs. 1393.03 and Rs. 1318.34 which was about 77.66 per cent, 78.87 per cent, and 77.85 per cent of total cost, respectively. Thus, the share of the variable cost in the total cost of honey production was lowest for large beekeepers followed by small and medium beekeepers.

The share of various components in the variable cost differs categorically. In the case of small beekeepers, sugar syrup used as supplement feed had largest weightage among the variable cost items accounting for 26.11 per cent of the total cost, while for medium and large apiary migration expenses was the most expensive variable component claiming 27.61 per cent and 29.50 per cent of the total cost, respectively. The migration expenses were highest for large apiary and lowest for the small apiary because average number of migrations was highest for medium beekeepers followed by large and small beekeepers.

At overall level cost incurred on the migration was Rs. 484.78 and its contribution was highest in the total variable cost as compared to other variable inputs. Out of the overall total cost incurred on the migration at aggregate level, the transportation (15.45 per cent) had highest proportion followed by apiary site rent (4.73 per cent) to the overall total cost. The cost incurred on care taker of bee colony for protection from theft and vandalism is 4.51 per cent of migration cost. The beekeepers also spend on accommodation while they temporarily reside on the site for management

and honey harvest during honey flow season. The share of this temporary residence contributes nearly 1.94 per cent while 1.17 per cent of the total cost goes for the travelling expenses. These patterns of cost incurred during migration remain same for all the categories with very little variation.

The cost incurred on sugar syrup at aggregate level was 24.65 per cent of total incurred cost. Among categories this proportion was highest for small apiary while lowest for large apiary. It was found that cost incurred on supplement feed requirement decreases with increase in number of hives. There were various reasons for this difference in the proportion of sugar syrup in the total variable cost. Firstly, the large and medium beekeepers purchased sugar in large quantity. So, sugar was available at lower price. Secondly, the migration also had a significant influence on requirement of supplement feed as during migration flora is available and therefore the need of supplement was decreased.

The next major component of variable cost was human labour. In this case, small beekeepers had incurred maximum labour expenses of Rs. 354.79 followed by medium and large beekeepers. This was because of the underutilization of man power in case of small apiary indicating that the small beekeepers could maintain more number of hives with the same man power. Further it was observed that the hired labour proportion was increasing with increase in the hive size owned while for imputed family labour converse holds true. This was because the large and medium beekeepers required more labour for loading and unloading of beehive as the average number of migration was more. In addition to this, they also had hired labour for honey extraction purpose.

The overall expense on total labour cost was Rs. 314.81 out of which Rs. 213.03 were spent on family labour and rest Rs. 101.78 on hired labour. Higher imputed value of family labour shows that the bee colonies were looked after by the beekeepers themselves and labour was hired casually only when needed.

The proportion of cost of comb foundation sheet at aggregate level was only 2.14 per cent of the total cost. It mainly depended on the number of new bee colonies generated. The share of comb foundation sheet cost in the total cost was 1.57 per cent, 2.26 per cent, 2.20 per cent for the small, medium and large beekeepers, respectively.

Honey storage container is needed for storage of harvest honey. The capacity of a container ranges from 22-24 kg. The average cost incurred on honey container per hive was quite low (i.e. Rs. 0.59) which was depending upon the level of production. As hive production was more in the case of medium apiary the cost incurred on the storage container was also high. The traders and processors purchased honey in the containers and subsequently returned the cost of container to beekeepers. Thus, the beekeepers had to bear only the cost of storage container for the honey that was retained for the off season, household consumption and for the honey sold directly to the consumer.

Another variable cost component was cost on medicines for the management of diseases and predators infestation. It was observed that cost on medicines decreases with increase in hive size. The proportion of the cost incurred on the medicines in the total cost for, small, medium and large apiary was 0 .75 per cent, 0.73 per cent and 0.69 per cent of the total cost, respectively. The overall cost incurred on medicine was Rs. 12.33 per hive which happened to be 0.71 per cent of the total cost. Further the interest on variable cost contributed about 3.78 per cent, 3.86 per cent and 3.80 per cent of total cost for small, medium and large beekeepers categories. At aggregate level the contribution of interest was 3.82 per cent. The miscellaneous expenses consisted of expenses on maintenance of equipments, rent for honey extractor etc. which shared on the average 0.58 per cent of total cost. These results indicate that medium beekeepers go for higher variable expenses to increase their returns.

Further at aggregate the cost incurred to produce per kg of honey and wax was Rs. 75.36 and Rs. 226.19 while among categories cost incurred was maximum for small beekeepers while minimum for medium beekeeper's category. The probable reason for this was higher production per hive and in addition to this advantage of economies of scale medium beekeepers.

On overall basis cost incurred on raising a unit of bee colony frame was Rs. 99.47. In case of large beekeepers minimum cost (Rs. 97.24) was incurred to raise a bee frame while maximum for small beekeepers.

5.2.2 Returns from beekeeping

The beekeepers in the area got returns from the sale of honey, wax and bee colonies. Honey is the main product of beekeeping industry. The returns from other bee products such as royal jelly, propolis and bee pollen were unexplored as beekeepers did not

focus to extract them due to the lack of knowledge, technological advancement and proper marketing channel. The returns mainly depend on level of production. The result related to returns per hive has been presented in Table 5.19.

It is clearly seen from the table that at aggregate level out of total gross returns, 87.02 per cent contributed from sale of honey and 10.19 per cent of sale of bee colonies. The remaining 2.88 per cent of gross return was from the sale of wax. Categories wise analysis reveals that the total returns from sale of honey for the medium apiary was highest Rs. 1745.34 while it was lowest for the small apiary of Rs. 1605.97 and for large apiary, Rs. 1651.27. The proportion of returns from sale of honey in the gross return was 85.54 per cent, 87.19 per cent and 90.26 per cent for medium, large and small apiary, respectively.

The gross returns from honey were further categorized on the basis of flora they utilized like mustard, litchi, forest and eucalyptus + mustard. Honey from flora of apple, jamun, peach etc. came in others category. Among them the share of the mustard honey at aggregate level was maximum (37.90 per cent) in terms of the value of the honey. It was followed by the forest, litchi, eucalyptus and others. Similar trend of share of returns from mustard honey was also found in medium and large apiary categories. But in the case of small apiary, the quantity and value received from the forest honey was highest which was followed by mustard, litchi and eucalyptus + mustard honey. This was because some of the small beekeepers avoided migration for mustard flora and were residing in their native district which was rich in forest / timber flora. In case of large apiary, the share of mustard honey was 41.10 per cent of the gross return from beekeeping, being maximum amongst all. The proportion of mustard honey in gross returned from beekeeping was 36.85 per cent and 27.40 per cent for medium and small apiary, respectively.

The overall average share of return from sale of litchi honey in the total returns was 14.32 per cent. In different categories of apiary, the contribution of returns from litchi honey in the total returns was 17.35 per cent, 15.12 per cent and 14.47 per cent for the small, medium and large apiary, respectively. The small beekeepers had higher proportion as compared to large and medium beekeepers from the sale litchi honey even though highest quantity of the litchi honey was sold in case of medium beekeepers. This was primarily because the small beekeepers sold larger portion of the honey to the consumers directly as compared to their counterparts. The honey from the jungle source also showed the similar trends. The proportion of value from sale of forest honey to total return was

Table 5.19: Return structure per hive per household for the beekeeping in Nainital Districts

(In Rupees/ hive)

Items		Beekeepers category							
		Small beekeepers		Medium beekeepers		Large beekeepers		Overall	
Products		Quantity (kg)	Value (Rs.)	Quantity (kg)	Value (Rs.)	Quantity (kg)	Value (Rs.)	Quantity (kg)	Value (Rs.)
1.Honey	Mustard	6.17	487.39 (27.40)	9.55	751.86 (36.85)	9.62	778.41 (41.10)	9.27	730.39 (37.90)
	Litchi	2.95	308.63 (17.35)	3.32	308.54 (15.12)	2.81	273.79 (14.45)	3.02	275.99 (14.32)
	Jungle	5.97	590.63 (33.21)	6.02	520.84 (25.52)	5.41	426.08 (22.49)	5.57	489.66 (25.44)
	Eucalyptics +sarson	1.74	154.79 (8.70)	1.66	141.67 (6.94)	2.11	166.25 (8.77)	1.89	158.08 (8.20)
	Others flora	0.52	64.53 (3.63)	0.21	22.40 (1.09)	0.11	6.70 (0.35)	0.20	23.20 (1.20)
	Subtotal	17.35	1605.97 (90.26)	20.76	1745.34 (85.54)	20.06	1651.27 (87.19)	19.95	1677.32 (87.02)
2. Wax		0.15	37.50 (2.10)	0.24	60.00 (2.94)	0.23	57.50 (3.03)	0.22	55.66 (2.88)
3. Bee colonies (No.)	Off season	1.25	125.00 (7.02)	1.75	175.00 (8.57)	1.55	155.00 (8.18)	1.58	158.00 (8.19)
	On season	0.05	10.00 (0.56)	0.30	60.00 (2.94)	0.15	30.00 (1.58)	0.19	38.53 (1.99)
	Sub total	1.30	135.00 (7.59)	2.05	235.00 (11.51)	1.70	185.00 (9.76)	1.77	196.53 (10.19)
Gross return from beekeeping (Rs./hive)		1778.47 (100.00)		2040.34 (100.00)		1893.77 (100.00)		1927.47 (100.00)	
Returns from per kg honey		92.56		84.07		82.32		83.97	
Net return from beekeeping over total cost (Rs./hive)		36.78		274.16		200.08		199.65	
Net return from beekeeping over variable cost (Rs./hive)		425.83		647.09		554.18		576.11	
Input- output ratio		1.02		1.16		1.12		1.12	

Figures in the parentheses indicate percentage to total

33.21 per cent, 25.52 per cent, 22.49 per cent for small, medium, large apiary, respectively. It shows decrease in contribution through jungle honey in terms of value with increase in apiary size. The overall return from sale of forest honey in the gross return from beekeeping was 25.44 per cent.

Eucalyptus + Mustard flora honey had overall returns from the sale of honey of Rs. 158.08 which accounted for 8.20 per cent of total returns from beekeeping. Among the categories, in case of large beekeepers it contributed maximum share to the gross return from beekeeping with value of Rs. 166.25 which accounted for 8.77 per cent. The contribution of other flora honey on the average was very less only up to 1.20 per cent of the total value of returns. In case of different categories the share of revenue from the other flora honey in total returns from beekeeping ranged from 0.35 per cent to 3.63 per cent.

Wax is an important byproduct in beekeeping. The average market price for the bee wax was worked out to be Rs. 250. The amount of wax produced for small, medium, and large beekeepers was 0.15 kg and 0.24 kg and 0.23 kg, respectively. Further it was found that the quantity of wax obtained was mainly depended on the amount of honey produced. The quantity of wax produced per hive was highest for the medium apiary and lowest for the small beekeepers. The quantity of the wax produced at overall level was 0.22 kg only.

From the economical point of view wax contribute 2.89 per cent in total gross return was and had the value of Rs. 55.66. Among different categories of beekeepers it was observed that the medium beekeepers has received maximum value share of Rs. 60 from wax which about 2.94 per cent. While the large beekeepers has maximum proportion of 3.0 per cent to their relative gross return from beekeeping with value of Rs. 57.60. The small beekeepers had lowest returns from wax among all categories both in value and proportion with value of Rs. 37.5 and proportion of 2.11 per cent of the gross return.

Beekeepers also enhance their returns through sale of bee colonies. The sale of bee colonies by the beekeepers was mainly done during the off-season while some sold colonies at the onset of season. The price of bee colonies both varied from Rs. 100 - 200 depending upon time of sale. At overall level share through sale of bee colonies in total return was 10.19 per cent. Which comprised 8.19 per cent and 1.99 per cent contributions from the sale of bee colonies during the off-season and the onset of season, respectively. For small, medium and large beekeepers the proportion of off season and on season was (7.02 per cent, 0.56 per cent), (8.58 per cent, 2.94 per cent) and (8.18 per cent, 1.58 per cent), respectively.

Further it was analyzed from the table that the gross return from sale of per kg of honey at aggregate level was Rs. 83.97. Among beekeeping categories it was highest for the small beekeepers followed by medium and large beekeepers i.e. Rs. 92.56, Rs. 84.07, and Rs. 82.32, respectively. The reason for higher gross return realized by small beekeepers was that small beekeepers sold higher proportion of their honey directly to the consumers after manual processing for which they got higher prices.

The net return from unit hive to the total cost was Rs. 199.65. It was highest in case of medium beekeepers about Rs. 274.16 while lowest for small beekeepers observed to be Rs. 36.78 only. It was due to less contribution of by products in returns and diseconomies of scale in case of small beekeepers. The overall gross returns over variable cost for the beekeepers per hive were Rs. 576.11. Among different beekeeping categories the medium beekeepers had maximum gross returns over total cost (Rs. 647.09) followed by large beekeepers (Rs. 554.18). The input output ratio was 1.12 at aggregate level which indicates that on an investment of rupee one beekeepers get Rs. 1.12 in gross return. The input to output ratio was highest for medium beekeepers i.e. 1.16 and lowest for small beekeepers i.e. 1.02. Thus, it was seen that medium beekeepers were having more profits and had high economic feasibility in comparison to the others.

This depicts that beekeeping was a remunerative enterprise in the area. It also shows the potential of beekeeping to be taken as additional income generating enterprise with crop farming.

5.3 Factors affecting honey output

To determine the factors affecting the honey production, regression analysis was done as mentioned in the chapter four of the present manuscript. Table 5.20 present the results of the log-linear regression analysis. It could be seen from the table that out of the thirteen explanatory variables, only eight variables were observed to be statistically significant to affect the honey production per hive per year. Out of these variables age was significant at one per cent significance level, beekeeping experience, apiary size, supplement feed, social group membership were significant at five per cent level of significance while the number of migration, cost on medicine, and labour (mandays) were significant at ten per cent level of significance. The remaining five variables i.e. annual income level, family size of household, beekeepers education level, forest land use right and training

attended by the beekeeper were showing non-significant relationship with per hive honey production. The perusal of the table indicates that coefficient of multiple determination R^2 was 0.8491. It implies that 84.91 per cent of the variation in honey output was because of explanatory variables included in the regression and rest 15.09 per cent was due to error.

5.20: Estimated regression coefficients (log-linear) for factors affecting honey output (kg/hive/yr) in the Nainital District

S. No.	Factors	Units	Coefficient	Standard Error	P - value
1.	**Intercept**	-	1.0756	0.5954	0.0774
2.	**Age of the beekeeper**	Years	-0.2194*	0.0790	0.0079
3.	**Beekeeping experience**	Years	0.0834**	0.0341	0.0185
4..	**Education level of beekeeper**	Years	0.0099	0.0987	0.9201
5.	**House hold Family Size**	Numbers	0.0078	0.0443	0.8601
6.	**Household annual Income**	Rs.(,000)	0.0552	0.0484	0.2596
7.	**Forest land use right**	1.No, 2.Yes	0.0291	0.0536	0.5894
8.	**Apiary size**	Numbers	0.1096**	0.0471	0.0247
9	**Training attended by the beekeeper**	Numbers	0.0372	0.0431	0.3929
10.	**Supplement Feed**	Kg/ hive	0.3430**	0.1533	0.0302
11.	**Labour**	Man days/ hive	0.1762***	0.0932	0.0884
12.	**Cost on medicine**	Rs./ hive	0.1679***	0.093271	0.0783
13.	**Social group member**	1.No, 2.Yes	0.1537**	0.065242	0.0227
14.	**Number of migration**	Numbers	0.1410***	0.073621	0.0616
15.	**Multiple determination**	-	0.8491	0.1591	-

*, ** and *** indicates significance level at 1 per cent, 5 per cent and 10 per cent, respectively.

Significant variables

As mentioned earlier only eight variables show significant relationship with honey output. The description about these variables is given in following sub sections.

5.3.1 Age of the beekeeper

The coefficient of regression shows inverse and significant relationship between age and honey production. Regression coefficient of age depicts that with 1 per cent

increase in age of beekeepers, the average honey production will decrease by 0.21 per cent. Beekeepers average age was found 40.11 years in the area and beyond the average age their involvement in beekeeping practices got reduced which lead to decrease in honey output. These results resembled to findings of Kharde and Kareem (2016) in their study on management practices of beekeeping in Nigeria.

5.3.2 Beekeeping Experience

The results from the model showed positive and significant effect of beekeeping experience on honey production with regression coefficient of 0.08 significant at 5 per cent level of significance. The coefficient of regression for beekeeping experience indicates that 1 per cent increase in number of years of beekeeping practices cause an increase of 0.08 per cent in per hive honey production. This can be explained as with higher level of experience, the skills and understanding about management of bee colonies also increased. In addition to this high experience of beekeeping practices also enabled the beekeepers to pursue honey production activities more efficiently. Thus, the efficient care and management of colonies by beekeepers resulted in higher productivity which led to increase in annual per hive honey production. This is in agreement with the findings of Masuku (2013) in Swaziland, Yimer (2014) in Ethopia, Dinka and Kumsa (2015) in Ethopia, Kareem and Kharde (2016) in Nigeria, and Otim et al., (2018) in Uganda that beekeeping experience has positive relationship with honey output.

5.3.3 Apiary size (number of colonies)

The results of the analysis clearly depict about the positive and significant influence of number of colonies on the per hive annual honey production. Higher the bee colonies owned by the beekeeper, higher was the per hive honey production. The regression coefficient (0.1096) indicates that, 1 per cent increase in apiary size tend to increase in the amount of honey produced per bee hive per year by 0.11 per cent. The findings were in tune with the observations of Gangwar (2005), Masuku (2013), Yimer (2014), Peter (2015) and Otim et al., (2018).

5.3.4 Supplement Feed

The coefficient of supplement feed showed that 1 per cent increase in amount of supplement feed provided to bee colonies increased the level of production from a hive by 0.34 per cent. The sugar syrup (supplement feed) acts as a source of energy to the bees during the dearth period. It enhanced the capability of bees to resist the diseases and predators attack by maintaining the activeness of bees during stress period. In addition, it favoured the breeding of

honey bees as it increased the egg laying which lead to subsequent colony development. Due to all these facts the supplement feed led to positive effect on honey production. This finding is an agreement with the observation of Emsen and Dodologlu (2007) in their study about effect of supplement feed on honey bee colony in Turkey.

5.3.5 Labour

Labour (measured by calculating the mandays spent per year on management of individual bee colony for honey production) had positive and significant relationship with the amount of honey production per hive per year. The magnitude of coefficient of regression of labour was (0.1762), which indicated that unit per cent increase in the labour spent in the management of bee colonies resulted in increase of 0.18 per cent of honey production. More manday involved tend to better care and management of bee colonies. Hence, better labour management contributed towards productivity in the entire production process which led to improved output quantities. This agrees with finding of Yimer (2014) and Peter (2015) that labour has positive relationship with honey production.

5.3.6 Cost on Medicine

The result from the model indicates positive relation of cost incurred on medicine with honey production per beehive. The result suggested that 1 per cent increase in cost of medicine provided to bee colonies for management of diseases cause an increase of 0.17 per cent in honey production. This shows that more amount of money spent on disease and predators' management results in healthier bee colony and that leads to produce higher amount of honey.

5.3.7 Social group memberships

The positive and significant relationship was observed between the social group membership and the amount of honey produced per hive. The results suggested that beekeepers that were practicing beekeeping in associations with other beekeepers realized 0.15 per cent more honey than those who did not have any association with their fellow beekeepers. Probable reason for this was that associations with others beekeepers have platform to share their ideas with each other and to learn from experience of each other. They have also supported each other in management of bee colonies. Yimer (2014) in his study shows positive non-significant relationship of social group membership with honey production.

5.3.8 Number of Migration

The results in the table indicate the significant positive relationship between number of migration beekeepers practice during a year and honey production. The value of regression coefficient suggested that an increase of 1 per cent in number of migration practices by beekeepers increased the per hive honey production by 0.14 per cent. This can be described as the beekeepers migrate their bee colonies to the abundant bee flora locality. It enables bees to get desired flora to produce more honey production. Thus, higher number of migrations led to the increase in honey productivity.

5.4 Disposal pattern of honey

Disposal pattern refers to the process and means through which producers accomplished and managed the sale of a commodity. In the present study the disposal pattern of honey produced by the beekeepers was studied to understand the way beekeepers get disposed off their honey.

5.4.1 Marketed and marketable surplus and consumption

Marketable surplus is the quantity of the produce or commodity remained for sale after meeting out producer's requirements for self-consumption and other utilization like charity, as a gift to friends and relatives. Thus, marketable surplus shows the quantity left out for sale in the market. The actual amount of produce sold in the market is termed as marketed surplus.

Production, consumption, retained stock and marketing/ marketed surplus of honey have been presented in Table 5.21. The table at a glance clearly shows that beekeepers' level of production was increases with increase in apiary size. The marketable and marketed surplus had increased with operation size of beekeeping while the stock retained and home consumption proportion was decreases with increase in number of hives. The value of stock retained was nearly equal in each category. At aggregate level the production per household was 2133.33 kg, out of which 96.85 per cent was sold in market and rest 3.15 per cent was for domestic consumption and stock retained for off season sale. There was only 1.40 per cent difference in marketed and marketable surplus. It indicates that beekeeper was not able to retain a large proportion of produced honey and reason for it was need of money to meet out enterprise expenses and improper storage facilities.

Table 5.21: Production, consumption, marketed and marketable surplus of honey

(kg/beekeeper)

S. No.	Particulars	Small beekeepers	Medium beekeepers	Large Beekeepers	Overall
1	Home consumption (C)	24.47 (2.98)	35.42 (1.69)	55.88 (1.53)	37.24 (1.75)
2	Marketable surplus (P-C)	795.73 (97.04)	2062.49 (98.31)	3597.06 (98.47)	2096.09 (98.25)
3	Stock retained for off season sale	28.95 (3.53)	31.25 (1.49)	29.41 (0.81)	30.00 (1.41)
4	Marketed Surplus	766.98 (93.53)	2031.24 (96.82)	3567.65 (97.67)	2066.09 (96.85)
5	Total production (P)	820 (100.00)	2097.91 (100.00)	3652.94 (100.00)	2133.33 (100.00)

Figures in the parentheses indicate percentage to total

5.4.2 Level of production and sales pattern of honey

Level of production and sales pattern has been presented in the Table 5.22. The table shows that due to unavailability of bee forage honey was not produced in the month of July, August and September. The stock of honey out of previous year production that was retained by beekeepers was sold during these months.

Further the table depicts that at aggregate level highest production was also there in the month of March which was about 21.39 per cent of the total production. It was followed by month of April with 15.32 per cent production. The least production was in the month of June. The table also shows that overall highest amount of honey was marketed in the month of April followed by March.

The minimum quantity of honey was sold in October with 0.59 per cent of total sales of honey. It indicates that March and April were the important months for production and sale of honey. In addition to this it was also observed that nearly two-third of total honey sold was disposed off only in three months viz. Feb, March and April. The probable reason for it was low price of honey at onset of season and the beekeepers were in hope of better prices. So they retained their produce and sold the produce at offset of season for realizing higher prices. The production in month of May and June was minimum as only few beekeepers migrate their bees to high hills of the district for the desired flora. Further, at aggregate level the average price was Rs. 83.98.

Table 5.22 Level of production and sales of honey through beekeepers in Nainital District.

(per beekeeper)

Particulars	Small beekeepers			Medium Beekeepers			Large beekeepers			Overall		
	Quantity produced (Kg)	Quantity sold (Kg)	Average price (Rs./ kg)	Quantity produced (Kg)	Quantity sold (Kg)	Average price (Rs./ kg)	Quantity produced (Kg)	Quantity sold (Kg)	Average price (Rs./ kg)	Quantity produced (Kg)	Quantity sold (Kg)	Average price (Rs./ kg)
October	640 (4.11)	-	-	2520 (5.00)	280 (0.57)	94.10	2980 (4.80)	450 (0.74)	79.5	5940 (4.64)	730 (0.59)	85.10
November	1840 (11.81)	1240 (8.51)	81.1	7850 (15.59)	1850 (3.79)	82.50	9850 (15.86)	2475 (4.08)	80.10	19240 (15.03)	5565 (4.49)	81.12
December	1960 (12.58)	1350 (9.27)	82	6780 (13.47)	2275 (4.67)	80.23	7410 (13.54)	2275 (3.75)	80.24	16690 (13.03)	5900 (4.76)	80.64
January	2150 (13.80)	1750 (12.01)	80.8	7550 (15.00)	2065 (4.24)	79.63	9250 (14.90)	2465 (4.06)	79.85	18950 (14.80)	6280 (5.07)	80.05
Febuary	2650 (17.00)	1520 (10.43)	94.4	7400 (14.70)	5185 (10.64)	81.73	9400 (15.14)	5435 (8.96)	81.24	19450 (15.19)	12140 (9.79)	83.10
March	3080 (19.76)	2660 (18.26)	98.1	10300 (20.45)	14400 (29.54)	84.35	13500 (21.73)	18850 (31.08)	83.09	26880 (21.39)	35910 (28.97)	84.71
April	2770 (17.78)	4800 (32.94)	95.9	7450 (14.80)	19765 (40.54)	83.27	9400 (15.14)	23950 (39.49)	82.22	19620 (15.32)	48515 (39.13)	84.00
May	350 (2.25)	850 (5.83)	101.9	240 (0.48)	2550 (5.23)	96.81	130 (0.21)	4350 (7.17)	83.80	720 (0.56)	7750 (6.25)	90.07
June	140 (0.90)	400 (2.75)	111.5	260 (0.52)	380 (0.78)	108.94	180 (0.29)	400 (0.66)	94.50	580 (0.45)	1180 (0.95)	104.97
Total	15580	14570	92.56	50350	48750	84.07	62100	60650	82.32	128030	123970	83.98

Figures in the parentheses indicate percentage to total

Note- negligible production of honey during July to September months

Retained honey was sale during July to September months

Across categories it was observed that the large and medium beekeepers had nearly same trend for monthly production and disposal of their honey. Small beekeepers on the average usually preferred to sell less during October to February as compare to their counterpart. All categories however had maximum production in the month of March and maximum sale in the month of April. The maximum average price for a unit of honey was Rs.111.50, Rs.108.94, and Rs.94.50 for small, medium and large beekeepers, respectively in the month of June. The minimum prices were received in all three categories in the month of January. The variation in average prices received by the beekeepers was due to variations in average price of honey received in different channels. The average price decreased with increase in size of beekeeping. The reason for this was decrease in quantum of honey sold directly to consumers.

5.4.3 Marketing channels

Marketing channel is the route through which a commodity moves from primary producer to final consumer. In between, many intermediaries play role at various stage of transaction. An attempt was made to identify existing marketing channels through which honey producers disposed off their honey and the share of produce they sold through respective channels they followed. beekeepers reported for three marketing channels were existing in the area. The intermediaries of these marketing channels were processors, traders and retailers.

Following marketing channels were prominent in the area:

Channel I- Producer ⇨Trader ⇨Processor ⇨Retailer ⇨Consumer

Channel II- Producer ⇨ Processor ⇨Retailer ⇨Consumer

Channel III- Producer ⇨ Consumer

Table 5.23 Marketing channels followed for disposal of honey in Nainital District

Particulars	Small		Medium		Large		Overall	
Marketing channel	Number of beekeepers followed	Quantity sold	Number of beekeepers followed	Quantity sold	Number of beekeepers followed	Quantity sold	Number of beekeepers followed	Quantity sold
I	10 (52.63)	7974 (54.73)	14 (58.33)	20416 (41.88)	9 (52.94)	20255 (33.40)	33 (55.00)	48645 (39.24)
II	8 (42.11)	5096 (34.98)	10 (41.67)	26584 (54.53)	12 (70.59)	39120 (64.50)	32 (53.33)	70800 (57.11)
III	15 (78.95)	1500 (10.30)	16 (66.67)	1750 (3.59)	8 (47.06)	1275 (2.10)	39 (65.00)	4525 (3.65)
Total	19 (100.00)	14570 (100.00)	24 (100.00)	48750 (100.00)	17 (100.00)	60650 100.00	60 (100.00)	123970 (100.00)

Figures in the parentheses indicate percentage to total

Table 5.23 clearly depicts that most of the beekeepers followed more than one channel to dispose off their produce. At overall level 53.33 per cent of beekeepers out of the total 60 beekeepers, sold around 57 per cent of total honey through marketing channel II. Nearly 39 per cent of honey was sold by 55 per cent of beekeepers through marketing channel I. Rest 3.65 per cent was sold by 65 per cent of honey beekeepers through marketing channel III. This route was followed by highest proportion of beekeepers but the share of honey sold through this marketing channel was minimum as final consumers bought small quantity of honey as per their requirement. It was due to low quantum of demand by consumers as they purchase only for their own consumption.

In case of small beekeepers 78.95 per cent of beekeepers followed marketing channel III and sold 10.30 per cent of their produce through it directly to consumers. Small beekeepers sold more than half of their honey through marketing channel I. The medium beekeepers mostly followed marketing channel I i.e. 58.33 per cent while disposed off maximum amount of honey through marketing channel II which was about 54.53 per cent of total quantity sold. In case of large beekeepers, the marketing channel II was accessed by most of the beekeepers and 64.50 per cent of produce was sold through this channel. These results indicate that small beekeepers found it comfortable to access through marketing channel I while large beekeepers through II. The proportion of quantum of produce and number of beekeepers followed marketing channel III was decreased with increase in apiary size whereas the amount of honey sold through marketing channel II was showing increasing trend.

5.5 Constraints faced by the beekeepers

Nainital district had a historical tradition and culture of beekeeping. Apiculture has an enormous potential in the area due to availability of endowment diversity of flora. In addition to this, the beekeepers of the area are well experienced, trained and hold great technological knowledge about the management of bees. They also have a better and regular contact with the extension agencies which are continuously working to enhance and encourage beekeeping activities. However, despite the above-mentioned facts, the district has not been free from the problems that come in the way of beekeepers to operate their enterprises successfully. As an outcome, the enormous potential for beekeeping remained untapped. This chapter is devoted to study about severity of the problems that were faced by the beekeepers while practicing beekeeping. For this, various constraints related to the beekeeping were identified and were grouped into two categories i.e.

production and marketing of honey. Specifically eleven constraints related to production of honey and eight linked with marketing of honey were identified. The respondents were asked to rank these constraints on the basis of severity and their importance for them. These constraints were analyzed and prioritized using the Garrett ranking techniques by enumerating the feedback of all respondents.

5.5.1 Constraints related to honey production

There were various problems limiting production of honey. The production level was directly related to the strength and activity of the bees in the colony. The major constraint in exploitation of the untapped potential of beekeeping activity has been presented in the Table 5.24. The table indicated that the most prioritized constraint with mean score of 59.37 was unfavourable weather and climatic conditions. The extreme hot and cool weather results in reduction of bee population in the colony. The cloudy and rainy season also exerts adverse impact on the bee colonies. In addition to this, these extreme weather conditions are most favourable for occurrence of disease and infestation of predators along with this nectar availability gets reduced.

Bee diseases and natural enemy's problems were the second most serious constraint in the eyes of the beekeepers. The mean score for this problem was 57.43. Several diseases were reported to occur in the bee colony causing a huge damage to the bee colony. Sometimes the occurrence of these diseases was not seen instantly and which actually cause havoc in later stages. These diseases lead to the inactiveness and even death of bees. The attacks of natural enemies like wasp, ant, wax moth, etc. also cause damage to bee colonies.

Table 5.24: Problems related to honey production in the Nainital district

S.No.	Constraints faced by the beekeepers	Garrett mean score	Rank
1	Unfavorable weather and climatic conditions	59.37	1
2	Shortage of bee forage	55.37	3
3	Bee diseases, predators and natural enemy problems	57.43	2
4	Lack of Credit supply for technology advancement	44.84	10
5	Problems during migrations	54.71	5
6	High cost of standardized beekeeping equipment	42.96	11
7	Death, Absconding, swarming and theft problem of bee colony	50.82	7
8	High cost of supplement feed (sugar syrup)	55.11	4
9	Cumbersome process and policy for forest land use right	52.61	6
10	Lack of Skilled labour availability	44.85	9
11	Pesticide poisoning	46.53	8

Next prioritized constraint was the lack of bee forage and secured 3rd rank (mean score 55.37) among eleven constraints. The availability of flora in the study area and places where the beekeepers visited during migrations had been continuously depleting. The unavailability of desired bee flora had reduced the honey yield as perceived by the beekeepers.

High cost of supplement feed was also reported by beekeepers as one of the major constraints with the mean of score 55.11. The reason was the high prices of sugar (used as supplement feed) during the period of 2017-18.

Fifth major constraint reported by beekeepers with mean score of 54.71 was problems related to migration. The beekeepers had to face many problems during migration from one place to another. High transportation cost, hesitation of farmers to keep the boxes in their field and unavailability of labour for loading and unloading, teasing by police men, shifting and travelling only in night hours etc. were reported as major issues that were resisting beekeepers to migrate their bee colonies to places where floral resources were unexploited.

Other important problem reported by beekeepers was cumbersome process and policies for forest land use right with mean score of 52.61. The beekeepers were permitted to keep their hive in forest by forest officials only for limited period due to several rules and regulation. The various policies like compulsory registration at least for three years reduced the utilization of forest flora resources. This results in migration to other floral resources otherwise leads to reduction in honey production.

Swarming, absconding, theft and vandalism have also caused the reduction in number and strength of bee colonies. These problems cause a jerk in the operation size of beekeepers as the apiary size gets reduced instantly. The rank of this constraint was seventh with the mean score of 50.82.

Pesticide poisoning with mean score of 46.53 was also a constraint faced by beekeepers as bees got infected because of the pesticide sprays in the crop field. It causes death to honey bees and was ranked eighth by the beekeepers.

Lack of skilled labour availability emerged as another constraint as most of the beekeepers performed maximum beekeeping activities by themselves. But the beekeepers who needed the skilled labour found it hard to meet out their need. The mean score of lack of skilled labour was 44.85 and ranked ninth by the beekeepers. Lack of credit supply for technology advancement and high cost of standardised equipments were other constraints faced by the beekeepers as only few beekeepers wanted to adopt new technology and standard equipments while rest were not interested in them.

5.5.2 Constraints related to marketing

In the recent past the popularity of beekeeping as a income generating activity has increased among rural people. Many of the progressive farmers adopted it and Nainital district has become highest producer of honey among all districts of Uttarakhand. Despite of these facts yet proper structured market was not available in the area. Improper marketing facilities emerged as crucial factor affecting sustainability of beekeeping business in the area. Various problems faced by beekeepers related to the marketing and sale of the produce are enumerated in Table 5.25.

The most important and prioritized problem was unfixed price of raw honey with mean score of 72.90. Beekeepers reported that the price of raw honey was unstable and a huge fluctuation was seen in price of honey. As an outcome of this fluctuation beekeepers felt about sale insecure of honey over time. It reduced the beekeepers' confident to expand their business. The unorganized and unregulated market structure emerged as second most important problem for marketing of honey. It was also reported by beekeepers that buyers purchased their honey from their places. So, there was availability of market at their door step but there were only few buyers in the market who usually form a cartel for them. It led to imperfect market structure without essential competitions among buyers. The next problem for marketing of honey experienced in the area was lack of government concern and support for marketing of honey with mean score of 55.77 was ranked 3rd. Government has focused on increasing beekeeping activities and honey production but does not take any significant initiative to provide better marketing facilities for the sale of honey in the district like cooperatives societies for milk procurement. Government does not show interest to fix the minimum support price for honey.

Table 5.25: Marketing problems faced by the beekeepers in the Nainital district

S.No.	Constraints	Garrett mean score	Rank
1	Unfixed price of raw honey	72.90	1
2	Lack of government concern and support for marketing of honey	55.77	3
3	Unorganized and unregulated markets	57.73	2
4	Lack of proper storage containers and facilities	44.16	5
5	Lack of information about honey market	43.23	6
6	Lack of credit supply for high cost standard implements used in processing, packaging and quality testing	38.33	7
7	Cumbersome procedure for registration as a firm for sale of honey in retail	54.14	4
8.	Unavailability of Quality testing lab	36.31	8

The next important constraint got mean score of 54.14 and ranked fourth by the beekeepers was cumbersome procedure to register a firm to sell the branded honey in market. It reduces the opportunity of value addition to the bee products.

Other important problem was lack of proper storage containers and facilities. Non-availability of standard storage container in the locality forced beekeepers to sell their produce during limited months. This problem got rank fifth in perception of the beekeepers with securing mean score of 44.16.

The problem of lack of information about honey market was secured sixth rank and mean score was 43.23. Beekeepers fully relied on local processors and trader for retrieving information about prevailing market prices.

The equipment used in standard processing, packaging and quality testing of honey were required higher investment. The financial situation of the beekeepers does not allow them to set up the infrastructure on their own. Financial institution does not supply credit for this purpose. This constraint was secured seventh rank.

The problem which least prioritized with minimum mean score of 36.31 by beekeepers was non-availability of quality testing laboratory like it is for soil testing, seed testing etc. There was no lab or any set up to testing the quality of honey. It results in similar prices for different quality of honey and beekeepers does not get advantage of producing better quality honey.

Overall, it was noted that unfixed price was the major problem which affect beekeepers most. Other problems were also important but the problem of honey pricing should be solved on priority basis. In view of beekeepers if they get real prices of their produce, many problems had been solved by themselves. The low and volatile price of honey make beekeepers confidence and motivation down.

Summary & Conclusion

Uttarakhand has 51.23 per cent of total population dependent on agriculture and allied activities for their livelihood. The agriculture production in this hilly state is low. Major reasons identified contributing to this are-

- Small and scattered land holdings,
- Difficult terrain,
- Unfavorable climatic conditions,
- low fertility due to leaching,
- lack of new and improved input technologies,
- lack of credit availability,
- lack of irrigation and
- marketing facilities.

It results in low income generation for farmers. To increase their income farmers have to shift to subsidiary occupation and additional income generating activities.

Apiculture is one of such subsidiary occupations which can be easily taken up as an additional source of income by the farm household. Although it required initial high investment but over the time investment requirement decreases so it can be taken up by small, marginal, landless farmer and educated employed youths. Thus, it can serve as additional income generating activity and provide round the year employment in the activities like managing hives, migration of bee colonies to distant places, harnessing production and marketing of honey and other bee products.

Honeybees provide a variety of products (honey, wax, pollen, royal jelly, propolis etc**.)** and subsequent pollination services to human society and ecosystem. Across the world honeybees provide support to millions of livelihoods along with this also enriching the ecosystem. Beekeeping emerged as an important enterprise for rural household.

Uttarakhand has 64 per cent of area under forest cover with huge potential for bee keeping because of its endowment with diversity in climate and vegetation resources. Though beekeeping is traditional activity in Kumaon hills and considered as the supplementary activity. But its potential as a source of income has been under-utilized and practically remained untapped. The state has not matched with its actual potential for honey production. At present total number of beekeeping units in India is about 2.5 Lakh out of which only about 8,700 units are in Uttarakhand (3.48 per cent) producing 2500 MT of honey in 2016-17. In view of low income, unemployment and vast scopes of beekeeping in Uttarakhand, the

present study was conducted to assess the economics of honey production and marketing in the Nainital district of Uttarakhand during the agricultural year 2017-18. It specifically aims at accomplishing the following objectives.

1. To assess the socio-economic characteristics of honey producers along with ongoing beekeeping practices;
2. To work out the costs of and returns from honey production;
3. To identify the factors affecting honey production;
4. To examine the disposal pattern of honey output; and
5. To enumerate the major constraints faced by the beekeepers in production and marketing of honey.

The study is based on primary data collected from 60 beekeepers spread in two purposively selected blocks (Ramnagar and Bhimtal) of Nainital district of Uttarakhand by interviewing individual respondents with pre-structured schedule. For this a list of beekeepers practicing migratory beekeeping through rearing *Apis Melliferra* species and having more than 10 modern hives was obtained for both blocks from Rajkiya Moan Palan Kendra (RMPK). From the list, 30 beekeepers were randomly selected from each of the two blocks for the study purpose. These respondents were classified into three categories are: small beekeepers (10 to 70 bee colonies), medium beekeepers (71 to 140 bee colonies) and large beekeepers (above 140 bee colonies) on the basis of number of bee colonies.

To obtain the first objective, descriptive analysis was done using averages, percentages etc. To attain the second objective, average annual cost and returns were calculated for different beekeepers category. To attain the third objective, regression analysis was done using linear and log linear model. However, the log linear function was selected as best fit. To examine the fourth objective, descriptive analysis using averages and percentages was done. To obtain the fifth objective, Garrett's ranking technique was used to rank the various constraints faced by the beekeepers.

Major findings of the study

The average age of beekeepers was about 40 years. It was observed that more than 75 per cent of the beekeepers were together in age group (30-60 years). 20 per cent were in age group of 18-30 years and remaining in old age group (61years and above). The average age of beekeepers varied from 38 to 40 years.

The average size of land holding of beekeepers was 1.57 acres. Out of total size (60), 83.33 per cent of the respondents owned lands up to 4 acre while 8.33 per cent of the respondents belonged to landless category. Among different categories, the average size of

land holding was 1 acres, 1.42 acres and 2.45 acres in case of small, medium and large beekeepers, respectively.

An attempt was made to analyses the size and family composition of the beekeepers household. It was seen that at aggregate level average family size was 6.28 out of which 57.80 per cent were male. 61.47 per cent of family members were aged between 15-50 years.

It was observed that among different beekeeper categories family size of beekeeper households was increases with increase in the apiary size. Nearly half (46.67 per cent) of the respondents had 5-7 persons in family. Out of 60 beekeepers about 22 per cent had family size of up to 4 members while 32 percent had family size of 8 or more.

An analysis of literacy level of the beekeepers revealed that out of total respondents 38.33 per cent of beekeepers were educated up to high school level followed by intermediate level (35 per cent) and upto junior high school (20 per cent). Only 6.67 per cent of household heads had literacy level up to graduation. Overall the average schooling years for beekeepers was 10.60 years and it was nearly similar for all categories.

The study revealed that farm enterprises like beekeeping, crop production, livestock, poultry etc. contributed about 71 per cent of total farm household. Among different farm activities contribution of beekeeping was maximum (23.43 per cent) followed by hired out orchard about 20 per cent. The non-farm enterprises contributed to about 29 per cent in total household income. Among beekeeper categories, the income from farm enterprise was found to be increased with increase in size while its converse was true in case of non-farm activities.

Average annual incomes of the three groups of beekeepers were estimated to be Rs. 118420, Rs. 163330 and Rs. 206470 for small, medium and large beekeepers, respectively. Larger size of farm and number of bee colonies were the main features giving higher income to large beekeepers. At aggregate level, large proportion i.e. 43.33 per cent of the respondents had annual income between 1-1.5 lakh followed by those earning more than 1.5 lakh (38.33 per cent) and up to 1.0 lakh (18.33 per cent), respectively.

The average number of livestock population in the farm was 4.15 on aggregate level. For marginal, small and medium beekeepers the total number of livestock was 4, 3.83 and 4.74, respectively. Further, the average number of poultry birds was 82.5 per beekeepers at aggregate level.

The Investment incurred in setting-up of beekeeping unit for small, medium and large apiary was Rs. 116366, Rs. 242787 and Rs. 420063, respectively. At the aggregate level investment incurred was Rs. 252982. Out of this, cost incurred on bee colony and bee boxes was nearly 80 per cent of the total establishment cost. Items like smoker, bee veil, honey extractor and jute bag collectively constituted around 5.00 per cent of total establishment cost.

The study of cropping pattern of beekeepers revealed that gross cropped area per beekeeping household increased as the size of apiary increased. It was evident from the fact that it was 1.97 acres, 2.56 acres and 4.22 acres in case of small, medium and large beekeepers, respectively.

It was also noticed that at aggregate level foodgrains accounted for more than half of the gross cropped area. The paddy, wheat and vegetables were main crops grown during Kharif, Rabi and Zaid season, respectively. The cropping intensity was 246 per cent with net cropped area 1.57 acres. During Zaid season, 15.88 per cent of grossed cropped areawas covered under vegetable crops.

The average experience to practice beekeeping was 11.15 year. Out of 60 beekeepers, 29 beekeepers accounting for 48.33 per cent was practicing beekeeping from 9 to 15 years followed by less than 8 years (28.33 per cent) while only 23.33 per cent had beekeeping experience more than 15 years. The average beekeeping experience increased with increase in number of colonies owned. This shows that beekeepers in the study area had high experience with good technical knowledge.

The average training programmes attended by the beekeepers were 3.37 and about three-fourth of beekeepers had attended more than 3 trainings organized by different beekeeping agencies.

There were two modes of beekeeping that were followed by the beekeepers in the study area viz. modern and traditional beekeeping. Modern beekeeping was practices by beekeepers on large scale while traditional beekeeping on small scale. On an average 108.06 modern beehives and 0.86 traditional hives were owned by beekeepers. Beekeepers mainly placed their hives in crop fields, orchards and forest land.

There were requirement for migration of bee colonies to avail appropriate nector and pollen to the bees. For this beekeepers mainly followed two types of the routes- intra-state (1 route) and inter-state (9 routes). In case of intra state movement, beekeepers

followed several route confined within the boundaries of native state while in inter-state movement the routes were extended beyond the boundaries of the state. The main destinations covered in routes were Bharatpur, Dausa, Sambhal, Badaun, Bareilly and Aligarh for flora of mustard, maize and pearl millet. Beekeepers visited Moradabad (U.P.) for covered eucalyptics+mustard flora. In addition to these beekeepers also visited U.S. Nagar (forest flora) and Nainital (litchi and forest) district of Uttrakhand.

Maximum 10 beekeepers followed the migratory route VIII. The highest average distance (968 km) was covered during migration through route VII while number of migration practice during a year was maximum i.e. 7.15 in following route X. Among different beekeeper categories the average number of migration and average distance covered was increased with increase in apiary size.

The frequency of honey harvest at aggregate level was 6.50 and total honey produced was 2133.33 kg. Among various categories it was 5.42, 7.16 and 6.71 for small, medium and large beekeepers categories with the production of 820 kg, 2097.92 kg, and 3653.94 kg, respectively. Overall 65 per cent beekeepers harvested honey 5 to 7 times in a year. The bee wax and rise in number of bee colonies was 23.53 kg and 23.67 kg, respectively.

Overall beekeepers sold only 2.83 per cent of honey in processed form and rest 97.17 per cent in raw form. The beekeepers store produced honey in tin containers and plastic bins with storage capacity of 22-24 kg.

Out of the total 60 beekeepers, 75 per cent of them formed their small groups which help them to share ideas and learn about benefits.

Total cost of maintaining a unit of hive was Rs. 1727.82 out of which 78.21 per cent was variable cost. Expenses on variable component viz. labour, migration and supplement were major constituent of total cost. The cost of production of honey, wax and raising a colony was estimated at Rs. 75.36, Rs. 226.19 per kg and Rs. 99.47 per unit frame.

For different beekeeper categories the total cost incurred on beekeeping practices per unit hive was assessed. It was estimated at Rs.1741.69, Rs. 1766.23 and Rs. 1693.69 for small, medium and large apiaries, respectively. The share of fixed cost was 22.34 per cent, 21.13 per cent and 22.15 per cent in case of small, medium and large beekeepers, respectively. The share of variable cost to the total cost per hive was 77.66 per cent, 78.87 per cent and 77.84 per cent in case of small, medium and large beekeepers, respectively. Major constituent of variable cost component were same as the aggregate level. Production cost of a unit kg of honey was maximum at Rs. 90.61 for small beekeepers while for medium and large beekeepers it was nearly about Rs. 73 per kg.

An examination of returns from a unit hive led to the conclusion that Rs. 1927.47 was gross return received per hive out of which 87.02 per cent of total income was obtained from honey production alone. Further investigation revealed that sale of raise bee colonies was another important source of income from beekeeping. It constituted 10.19 per cent of total return while wax contributed about 2.88 per cent of the gross return. The return from a unit kg of honey was Rs. 83.97 and net return per hive over total cost was Rs. 199.65. The input to output ratio was 1.12.

Among beekeepers categories the gross returns per hive were Rs. 1778.47, Rs. 2040.34 and Rs. 1893.77 for small, medium, and large beekeepers categories, respectively. The contribution of honey to the gross return was maximum in case of small beekeepers followed by large beekeepers (87.19 per cent) while minimum for medium beekeepers (85.54 per cent). The trend was reverse in case of contribution from sale of bee colonies. The share of income from sale of bee wax was found to be increased with increase in apiary size. The input to output ratio was maximum i.e. 1.16 in case of medium beekeepers followed by large beekeepers (1.12).

The regression results showed that about 85 per cent of the variability in production was accounted for explanatory variables included in the model. Out of the thirteen explanatory variables, eight were found significant viz. beekeeping experience, apiary size, supplement feed, social group membership, labour, cost on medicine and number of migration were positively significant, while the regression coefficient of age was negatively significant.

The analysis of marketable surplus of honey revealed that marketable and marketed surplus increased with increase in apiary size. Overall the production per household was 2133.33 kg out of which 96.85 per cent was sold in market and rest 3.15 per cent was kept for domestic consumption and for off-season sale. There was only 1.40 per cent difference in marketed and marketable surplus. It indicates that beekeepers were not able to retain a large proportion of produced honey for long time due to of improper storage facility in locality.

Three major marketing channels prevailed in the study area for the marketing of honey were-

I. Channel I (Producer-Trader-Processor-Retailer-Consumer),
II. Channel II- (Producer- Processor-Retailer-Consumer) and
III. Channel III (Producer-Consumer)

The maximum quantity i.e. 57.11 per cent of honey was sold through marketing channel II. As high as 39.24 per cent of honey was sold by 55 per cent of total beekeepers

through marketing channel I. Rest 3.65 per cent was sold by 65 per cent beekeepers through marketing channel III. Maximum amount of honey was sold in month of April followed by March. This was because the beekeepers retained their honey till end of season in hope of better prices at the offset of season.

Climatic and weather conditions, shortage of bee forage, diseases of honey bees, high cost of supplement feed, migratory problems and rules and regulation for forest land use right were major constraints in production of honey reported by honey producers. Major marketing issues faced by beekeepers in the study area were unfixed honey price, unorganized and unregulated market, lack of government concern and support for marketing of honey along with cumbersome procedure for retail sale.

Conclusions

The beekeepers in the study area were highly experienced and trained but rigid in adoption of new technologies and utilization of standardized equipments. Average age of beekeepers in the area was 39.50 years. Most of the beekeepers had only pursued basic education and only few were highly educated.

Beekeepers mainly had marginal land holdings with few having small land holding. Wheat, paddy, vegetables and fodders were the major crops grown in the area. Beekeeping is the main source of income for them. Beekeeper-households owned significant livestock and poultry birds for income generation.

Beekeepers owned about 109 beehives and practice migration in search of desire flora to different places within state and also extended to other state.

The honey was harvested 6.50 times in a year from a hive and beekeepers get about 20 kg of honey per hive. The cost of and gross return from beekeeping was Rs. 1727.82 and Rs. 1927.47 and the input to output ratio was 1.12. The cost of and return from honey production was Rs. 75.36 per kg and Rs. 83.97 per kg. Due to these facts beekeeping emerges as a remunerative enterprise particularly to utilize surplus family labour whose opportunity cost was nearly zero in the study area

Out of thirteen variables, ‘beekeeping experience’, ‘apiary size’, ‘supplement feed’, ‘labour’, ‘cost on medicine’, ‘social group membership’ and ‘number of migration’ were positively significant while ‘age’ was negatively significant factor affecting honey production.

There were only few buyers in the market and there was no competition in the market for purchases of honey among buyers. Beekeepers have no opportunity to decide or get satisfactory price of their produce. Beekeepers mostly sold their honey directly to the

processor. March and April were most important months from view of level of production and disposal of honey. Unconditional weather and climatic conditions, bee diseases and unfixed price of honey were major problems faced by the beekeepers.

Policy implication

a) Inview of profitability of the enterprise coupled with potentiality and availability of conducive environment and rich flora, bee keeping as an allied agriculture activity should be promoted among rural mass in the hilly states like Uttarakhand. This will not only help increasing the income of farmer but will also help addressing the problems of unemployment and migration. In this context government should design awareness programmes and should provide incentives and facilities to attract the attention of rural people to adopt beekeeping activities as their occupation.

b) Despite having good experience and training in beekeeping, the beekeepers use primitive technologies and equipments, which results in low return and efficiency. It also affects quality of honey and other bee products. Beekeepers should be sensitized about the benefits of modern beekeeping technology. Therefore, beekeepers should be encouraged to adopt new technology through field demonstrations and specialized training programmes to highlight the benefits of modern technology.

c) The important components of cost incurred to maintain unit hive were migration and sugar syrup. In order to reduce the expenses towards migration the government needs to provide relaxation in the strict and stringent rules related to the utilization of forest floral resources by the local people. Further, to reduce the cost of supplement feed, the provision of subsidized sugar to registered beekeepers should be made.

d) Government intervention in the marketing of honey seems inevitable since beekeepers are forced to sell honey at low prices to the traders in the absence of organized marketing and procurement system in the area. Price support mechanism through procurement centres alike field crops can be attempted for honey as well. Price guarantee will encourage beekeepers to increase production of honey.

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Appendices

APPENDICES

ANNEXURE I

Beekeepers's questionaire for production and marketing of Honey

Date of interview:

1. General features of beekeeper

Personal information about respondent

(a)	Respondent Name	**:**	**(b)**	Age	**:**	
(c)	Education level	**:**	**(d)**	Gender	**:**	Male Female
(e)	Village	**:**	**(f)**	Marital Status	**:**	
(g)	Block	**:**	**(h)**	Status in family	**:**	
(i)	District	**:**	**(j)**	No. Members in Family	**:**	
(k)	Occupation	Main Subsidiary	**(l)**	Annual income	**:**	

2. Details about the beekeeper's family

S. No	Category of members	Age group (years)	Number	Gender	
				Male	Female
1.	**Children**	0-14			
2.	**Youth**	15-30			
3.	**Matured**	30-60			
4.	**Old**	>60			

3. Do you have owned land?

if yes then provide following detail.

S. No	Category	Area (Acre)	Irrigated	Non irri.	Irrigation source
1.	**Owned**				
2.	**Leased in**				
3.	**Leased out**				
4.	**Total**				

4. Cropping pattern

Plot No	Crops grown												If hired,	Remark
													Rate/area	
	Kharif				Rabi				Summer					
	Irrigation		Unirrigated		Irrigation		Unirrigated		Irrigation		Unirrigated			
	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area	Crop	Area		

5. Do you keep livestock?

if yes then provide details about them**.**

S. No	Types	Number
1.	Bullock	
2	He-buffaloes	
3.	Cow	
4.	She-buffaloes	
5.	Goat	
6.	Poultry	
7.	Young stock (cow & buffaloes) Age under 3 year	
8.	Sheep	

6. Do you have income sources other than the beekeeping?

If yes then provide details about them.

S. No	Particulars Sources	Income (Rs.)		
		Sale of product	Sale of by product	Others
1.	Crop production			
2.	Fisheries			
3.	Hired out orchard			
4.	Poultry			
5.	Livestock production			
If other source of income specify,		Business	Shop	Services
6.	Amount income generate			

7. Beekeeping activities

a) When did you start beekeeping activities? **.....**

b) Number of training attended ……..

c) How many beehives do you have……..

i). How many of these are modern beehives……..

ii). How many of these are traditional beehives……..

d). Which species do u reared? ……..

e). Where did you get improved beehives?

{i} From NGOs

{ii} RMPK

{iii} KVIC……

{iv} From progressive beekeepers

{v} fabricate by self

f).Where did you get inputs and extension services concerning honey production on the last year?

{i} Village extension officer

{ii} KVIC……..

{iii} RMPK ……

{iv} Others specify ……

g). Do you have a member of social group for performing beekeeping activities?

If yes then specify total members of group. ……..

h). Do you have all essential beekeeping equipments?

If not. Do you hire equipment for carrying your operations in last year?

{1} Yes {2} No

If Yes, Equipment Source Payment rate (per ha/hour)

i).What are the main sources of your labour force in last year ?

(i) Family labour {1} Yes {2} No

(ii) Hired labour {1} Yes {2} No

(iii) Combination of the above {1} Yes {2} No.

j).List of operation requires hire labour forces?

k).What has been the production for the year in compare to last year?

{i} Increasing

{ii} Decreasing

{iii} Remain same

l).What are your futures plans on beekeeping enterprises?

{i} Expand

{ii} Reduce

{iii} Continue the same

{iv} Others (specify)……

m). How do you collect market and price informations for honey?

{i} Direct visit to the market

{ii}Crosschecks with fellow beekeepers

{iii} hear from dealers/ agent

{iv} from extension officers

{v} others (specify)……

n). What has been the price for bee products produce for the year in compare to last year?

{i} Increasing

{ii} Decreasing

{iii} Remain same

o). Do u done beekeeping through stationary or migratory activities?

If migratory then describe the migratory route and total distance covered.

8. Honey production

a). No. of round of honey harvest taken during the year ……

b). Total honey production:

c). Amount of honey sold during this year 2017-2018: Raw processed

d). Amount of honey consumed:

e). Stock retained for sale**:**

9. Floral wise honey production

S. No	Honey produces from different flora	Amount
1.	**Litchi**	
2.	**Sarson**	
3.	**Eucalyptis + Sarson**	
4.	**Forest tree**	

10. Marketing of honey

S. No	Quantity	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1.	Quantity Produced(kg)												
2.	Quantity sold (kg)												
3.	Average Price(Rs/kg)												

11. Sale of honey to buyer

S. No	category of buyer	Amount of produced sold (kg)	Price received (Rs/kg)
1.	Agent		
2.	Processor		
3.	Consumer		

12. Fixed cost

S. No	Particulars	Quantity No.	Unit Cost (Rs.)	Expected life(yrs)	Description of purchase schedule in different year	Present value	Depreciation value
1.	Bee hives						
2.	Stand						
3.	Smoker						
4.	Bee veil						
5.	Honey storage container						
6.	Honey extractor						
7.	Queen catch						
8.	Swarming bag						
9.	Queen shell protector						
10..	Forest land use fees						
11.	Miscellaneous items						
	Total						

13. Operational cost

S. No	Annual expenditure	Quantity		Average cost		Expenditure
1.	Comb foundation sheets(no.)					
2.	Feed (Sugar Syrup)(kg)					
3.	Medicines (Rs.)					
4.	Human labour a) during migration b) during extraction c) during seasonal management	Family	Hired	Family	Hired	
5.	Transportation charges (Rs.)					
6.	Apiary site rent during migration (Rs.)					
7.	Miscellaneous expenses (Rs.)					
	Total					

14. Returns from honey

S. No	Income/returns from sale of	Type	Quantity	Average price(Rs.)	Description
1.	Honey	Sarson			
		Litchi			
		Trees/ forests			
		Eucalyptics + Sarson			
2.	Bees wax				
3.	Propolis				
4.	Bee colonies	Off season			
		On season			
	Total				

15. Constraints related to Marketing of honey

S. No	Constraints	Rank
1.	Unfixed price of raw honey	
2.	Lack of government concern and support for marketing of honey	
3.	Unorganized and unregulated markets	
4.	Lack of proper storage containers and facilities	
5.	Lack of information about honey market	
6.	Lack of credit supply for high cost standard implements used in processing, packaging and quality testing	
7.	Cumbersome procedure for registration as a firm for sale of honey in retail	
8.	Unavailability of Quality testing lab	

16. Constraints related to production of honey

S. No.	Constraints	Rank
1.	Pesticide poisioning	
2.	Unfavorable weather and climatic conditions	
3.	Shortage of bee forage	
4.	Bee diseases, predators and natural enemy problems	
5.	Lack of Credit supply for technology advancement	
6.	Problems during migrations	
7.	High cost of standardized beekeeping equipment	
8.	Death, Absconding, swarming and theft problem of bee colony	
9.	High cost of supplement feed (sugar syrup)	
10.	Cumbersome process and policy for forest land use right	
11.	Lack of Skilled labour availability	

ANNEXURE II

Zero order correlation matrix of explanatory variables (linear function)													
	Age	**Beekeeping experience**	**Education**	**Family size**	**Income**	**Forest land use right**	**No. of bee box**	**Training**	**Feed**	**Lab**	**Com**	**Social**	**Migration**
Age	1												
Beekeeping experience	0.623474	1											
Education	0.15557	0.329757	1										
Family size	0.115469	0.251327	-0.04211	1									
Income	0.274603	0.445253	0.313161	0.172685	1								
Forest land use right	0.135799	0.168591	0.237533	0.065549	0.221396	1							
No.of bee box	0.1051	0.322856	0.131047	0.23079	0.474695	0.035699	1						
Training	0.369939	0.489572	-0.02724	0.379736	0.193498	0.161975	0.308891	1					
Feed	0.118942	0.348689	0.136899	0.239388	0.470116	0.082855	0.982347	0.396271	1				
Lab	0.19013	0.400298	0.135951	0.265856	0.499401	0.046018	0.937744	0.387519	0.935105	1			
Com	0.189967	0.412357	0.172245	0.202187	0.461206	0.120782	0.944443	0.40477	0.937712	0.90938	1		
Social	0.047205	0.246486	0.1432	0.183886	-1.5E-16	0.442881	-0.13039	0.295892	-0.07019	-0.06031	-0.08932	1	
Migration	-0.05045	0.246371	0.368314	0.177835	0.305701	0.078173	0.511059	0.337561	0.550109	0.505761	0.477465	0.283487	1

ANNEXURE III

Zero order correlation matrix of explanatory variables (log linear function)													
	Age	**Beekeeping experience**	**Education**	**Family size**	**Income**	**Forest land use right**	**No. of bee box**	**Training**	**Feed**	**Lab**	**Com**	**Social**	**Migration**
Age	1												
Beekeeping experience	0.54069	1											
Education	0.096995	0.259044	1										
Family size	0.056131	0.272295	-0.0283	1									
Income	0.12418	0.286402	0.281232	0.203629	1								
Forest land use right	0.117653	0.185202	0.219286	0.013301	0.267921	1							
No.of bee box	0.208514	0.61456	0.194461	0.310066	0.548307	0.168112	1						
Training	0.369771	0.567425	-0.01916	0.376944	0.25717	0.148889	0.483143	1					
Feed	0.037614	0.427137	0.175369	0.070998	0.10242	0.214033	0.206542	0.508354	1				
Lab	0.004408	-0.36468	-0.21643	-0.15669	-0.31183	-0.20672	-0.69037	-0.25186	-0.11718	1			
Com	0.266778	0.489749	0.162621	0.007866	0.034374	0.249775	0.20573	0.460732	0.500532	-0.06113	1		
Social	0.047762	0.355915	0.135649	0.136982	-0.00372	0.442881	0.112816	0.307655	0.38624	-0.08226	0.272693	1	
Migration	0.027162	0.491198	0.351775	0.211102	0.396461	0.097654	0.727052	0.470275	0.43024	-0.5139	0.248982	0.317701	1

ANNEXURE IV

District-Wise Production of Honey in Uttarakhand (*Apis Melliferra*)

S. No.	District	No. of beekeepers	No. of colonies	Production (MT)
1.	**Dehradun**	100	7000	231.00
2.	**Nainital**	200	12000	396.00
3.	**Pauri**	20	1500	49.00
4.	**Tehri**	35	1600	52.00
5.	**Haridwar**	205	10000	330.00
6.	**Udham Singh Nagar**	20	1000	33.00
	Total	590	33100	1098.00

Sources: Rajkiya Moan Palan Kendra (RMPK), office records

ANNEXURE V

District-Wise Production of Honey in Uttarakhand (*Apis Cerena*)

S. No.	District	No. of Beekeepers	No. of Colonies	Production (MT)
1.	**Alomra**	370	1110	14.44
2.	**Bageshwar**	215	645	8.38
3.	**Pithoragarh**	650	4000	52.00
4.	**Champawat**	300	1500	19.50
5.	**Chamoli**	600	2200	28.60
6.	**Rudraprayag**	150	300	4.00
7.	**Uttarkashi**	560	2040	26.52
8.	**Dehradun**	210	600	8.20
9.	**Nainital**	650	6000	78.00
10.	**Pauri**	200	1600	20.80
11.	**Tehri**	150	1000	13.00
	Total	4055	20995	273.44

Sources: Rajkiya Moan Palan Kendra (RMPK), office records

ANNEXURE VI

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "scores"

Percent	Scores	Percent	Scores	Percent	Scores
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	13.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.95	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33	-	-
20.93	66	81.99	32	-	-

VITA

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ABSTRACT

Beekeeping is considered as a potential subsidiary occupation for generating additional income for enhancing rural livelihood. India holds eleventh position in honey production in the world. In India, Uttarakhand occupies ninth position in honey production in which major contribution is from Nainital district. In spite of these facts, very few rural people have adopted beekeeping on a commercial scale. In this backdrop, the present study was conducted to analyze the economics and marketing pattern of honey production.

The study was based on primary data, collected from 60 beekeepers engaged in migratory beekeepeing, selected equally from Bhimtal and Ramnagar blocks of Nainital district. Simple descriptive tools along with regression analysis were used to attain several objectives of the study.

The results revealed that average schooling years for beekeepers was 10.60 years in the study area. Average age of beekeepers was 39.50 years along with beekeeping experience of 11.15 years and 3.37 training programmes were attended by beekeepers. The average size of operational holding was found to be 1.57 acre per household at aggregate level. Wheat, paddy, vegetables and fodder were the principal crops grown by beekeepers in the study area. Beekeeping enterprise contributed maximum 23.43 per cent in the households' annual income. At the aggregate level investment incurred to establish an apiary was Rs. 252982, out of which 80 per cent expenses were on bee colony and bee boxes. On an average 108.06 modern beehives and 0.86 traditional hives were owned by beekeepers.

Two types of migratory route viz. inter-state and intra-state were followed by beekeepers during migration. The migration distance varied from 85 km to 968 km for different routes. Overall, average distance covered was 613 km with 6.10 average numbers of migrations. With 6.5 frequency of honey harvest average annual honey production per beekeeper was 2133.33 kg. The bee wax and rise in number of bee colonies was 23.53 kg and 23.67 per beekeeper respectively. Beekeepers sold only 2.83 per cent of honey in processed form and rest 97.17 per cent in raw form.

On overall basis the total cost incurred to maintain a unit hive was Rs. 1727.82 out of which 78.21 per cent was variable cost. Main components of variable cost were expenses on migration, sugar supplement and labour. Overall gross return from unit hive was Rs. 1927.47. The cost of production of a unit of honey, wax and bee frame was found to be Rs. 75.36, Rs. 226.19 and Rs. 99.47, respectively. The gross returns from per kg of honey, wax and unit bee frame were Rs. 92.56, Rs. 253 and Rs. 111.03, respectively.

Out of total thirteen explanatory variables, 'beekeeping experience', 'apiary size', 'supplement feed', 'labour', 'cost on medicine', 'social group membership' and 'number of migration' were positive and significant variables while 'age' was negatively significant variable that affected honey production.

Out of total produced honey 96.85 per cent was sold in the market. The maximum amount of honey (57.11%) was sold through marketing channel II (Producer- Processor-Retailer-Consumer). About 39 per cent of honey was sold by 55 per cent of beekeepers through marketing channel I (Producer-Trader-Processor-Retailer-Consumer). Rest only 3.65 per cent was sold by 65 per cent beekeepers through marketing channel III (Producer-Consumer). March and April were most important months from view point of level of production and disposal of honey.

Climatic and weather conditions, shortage of bee forage, diseases of honey bees, high cost of supplement feed, migratory problems and regulation for forest land use right were major constraints in honey production reported by beekeepers. Major marketing problems were unfixed price of honey, unorganized and unregulated market, lack of government concern and support and cumbersome procedure for retail sale.

The major policy implications emerged from the study were (1) Promotion of beekeeping as a subsidiary enterprise in rural area to address the issues of income, employment and migration. (2) Creation of awareness among beekeepers to take the advantages of latest beekeeping practices. (3) Relaxation in rules and regulations of forest land used right to utilize forest flora and to provide sugar at subsized rate. (4) Evolving price support mechanism for better marketing of honey

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सारांश

मधुमक्खी पालन को ग्रामीण आजीविका को सुदृढ़ करने के लिए सम्भावित सहायक व्यवसाय माना जाता है। विश्व में भारत शहद उत्पादन में ग्यारहवें स्थान पर है। भारत में, उत्तराखण्ड राज्य शहद उत्पादन में नौवें स्थान पर है, जिसमें प्रमुख योगदान नैनीताल जिले का है। इस तथ्य के बावजूद बहुत कम ग्रामीण व्यवसायिक पैमाने पर मधुमक्खी पालन करते हैं। इस पृष्ठभूमि में, वर्तमान अध्ययन, शहद उत्पादन के अर्थशास्त्र और विपणन स्वरूप का विश्लेषण करने के लिये किया गया था।

यह अध्ययन नैनीताल जिले के भीमताल और रामनगर ब्लॉक के 60 मधुमक्खी पालकों से एकत्रित प्राथमिक आकड़ों पर आधारित है। प्रतिगमन विश्लेषण के साथ सरल वर्णनात्मक उपकरणों का उपयोग अध्ययन के उद्देश्यों को प्राप्त करने के लिये किया गया था।

अध्ययन के परिणामों से यह ज्ञात हुआ कि क्षेत्र में साक्षरता का औसत स्तर 10.6 स्कूली वर्ष था। मधुमक्खी पालकों की औसत आयु 39.50 वर्ष थी और उनका मधुमक्खी पालन का अनुभव 11.15 वर्ष पाया गया। मधुमक्खी पालकों द्वारा औसतन 3.37 प्रतिशत प्रशिक्षण कार्यक्रमों में प्रतिभाग किया गया। मधुमक्खी पालक के परिवारों में औसतन 6.28 सदस्य और परिचालन भूमि 1.57 एकड़ पायी गयी। इस क्षेत्र में गेहूँ, धान, सब्जियॉ, चारा प्रमुख फसलें थी तथा पशुओं की औसत संख्या 4.15 पशु प्रति परिवार थी। शहद उत्पादक परिवारों की औसत वार्षिक आय रू0 1,61,330 थी, जिसमें प्रमुख योगदान (23.43 प्रतिशत) मधुमक्खी पालन उद्यमों का था। समग्र स्तर पर एक मधुवाटिका (ऐपिरी) स्थापित करने के लिए कुल 2,52,982 रू0 था, जिसमें से 80 प्रतिशत खर्च मधुमक्खी कॉलोनी और बक्से पर हुआ।

मधुमक्खी पालकों के पास औसतन 108.06 आधुनिक और 0.86 पारम्परिक बक्से थे, जिन्हें वे मुख्य रूप से खेतों, बागानों और वन भूमि में रखते थे। मधुमक्खी पालकों द्वारा अन्तरांज्यीय और आन्तरिक राज्यीय दो प्रकार के प्रवासी मार्गों का पालन किया जाता था। विभिन्न मार्गों के लिये प्रवास की दूरी 85 किमी0 से 968 किमी0 तक थी, कुल मिलाकर औसत दूरी 613 किमी0 थी जिसमें पलायन की औसत संख्या 6. 10 थी। समग्र स्तर पर मधुमक्खी पालकों द्वारा 6.50 की फसल आवर्ती के साथ औसतन 2133.33 किग्रा0 शहद का उत्पादन किया तथा मधुमक्खी मोम का उत्पादन और मधुमक्खी कॉलोनी में वृद्धि क्रमशः 23.53 किग्रा0 और 23.67 प्रति मधुमक्खी पालक थी। समग्र मधुमक्खी पालकों ने प्रसंस्कृत रूप मे केवल 2.83 प्रतिशत और कच्चे रूप में 97.17 प्रतिशत शहद बेचा।

मधुमक्खी के एक बक्से के रख–रखाव की कुल लागत 1727.83 रू0 थी, जिसमें से 78.21 प्रतिशत परिवर्तनीय लागत थी। परिवर्तनीय लागत के मुख्य घटक पलायन, चीनी और श्रम पर खर्च थे। शहद, मोम और एक मधुमक्खी छत्ते की निर्माण की अनुमानित लागत क्रमशः 75.36 रू0 प्रति किग्रा0, 226.19 रू0 प्रति किग्रा0 और 99.47 रू0 प्रति सांचे थी और सकल लाभ क्रमशः 92.56 रू0 प्रति किग्रा0, 253 रू0 प्रति किग्रा0 और 111.03 रू0 प्रति सांचा था। कुल सकल लाभ 1927.47 रू0 प्रति बक्सा हुआ।

''मधुमक्खी पालन के अनुभव 'मधुवाटिका आकार', 'पूरक आहार', 'श्रम', 'दवा पर खर्च', 'सामाजिक समूह की सदस्यता' और 'प्रवास की संख्या' शहद उत्पादन की क्षमता को प्रभावित करने में सकारात्मक रूप से महत्वपूर्ण कारक थे, जबकि मधुमक्खी पालक की उम्र का नकारात्मक प्रभाव पाया गया।

कुल उत्पादित शहद में से 96.85 प्रतिशत बेचा गया, शहद की अधिकतम मात्रा (57.11 प्रतिशत) विपणन चैनल II (उत्पादक–प्रोसेसर– खुदरा व्यापारी– उपभोक्ता) के माध्यम से बेची गई। मार्केटिंग चैनल III (उत्पादक – उपभोक्ता) के माध्यम से केवल 3.65 प्रतिशत, बाकि 65 प्रतिशत मधुमक्खी पालकों द्वारा बेचा गया था। शहद के उत्पादन और निपटान के स्तर के दृष्टिकोण से सबसे महत्वपूर्ण माह मार्च और अप्रैल थे।

मधुमक्खी पालकों के अनुसार जलवायु और मौसम की स्थिति, मधुमक्खियों के रोग, पूरक आहार की उच्च लागत, प्रवासी समस्याऐं और वन भूमि उपयोग के नियम आदि शहद उत्पादन में प्रमुख बाधाऐं थी। प्रमुख विपणन समस्याओं में शहद की अस्थिर कीमत, असंगठित बाजार, सरकारी समर्थन का अभाव आदि थी।

इस प्रकार अध्ययन से उभरे प्रमुख नीतिगत निहितार्थ इस प्रकार हैं (1) ग्रामीण क्षेत्र में आय, रोजगार और पलायन के मुद्दों के समाधान के लिए एक सहायक उद्यम के रूप में मधुमक्खी पालन को बढावा देना। (2) मधुमक्खी पालन की नवीनतम पद्धति का लाभ लेने के लिए मधुमक्खी पालकों के बीच जागरूकता का सृजन करना। (3) वन वनस्पितियों के समुचित उपयोग के लिए वन भूमि के नियमों और विनियमों में छूट का प्रावधान तथा मधुमक्खी पालकों को निर्वाह दर पर चीनी उपलब्ध कराना। (4) शहद के बेहतर विपणन के लिए मूल्य समर्थन तंत्र विकसित करना।

(अनिल कुमार)
सलाहकार

(शुभम् आर्य)
लेखक