Apiculture for Sustainable Agriculture

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Abstract

India has tremendous opportunities on the apiculture (beekeeping) due to the richness in the honeybee's species and the availability of plenty of floral diversity. There exist three native honeybee's species the little bee *Apis florea*, the rock bee *Apis dorsata*, and Indian hive bee *Apis cerena indica* and one European honeybee species *Apis mellifera* L. which is indigenous to Europe and Africa. The beekeeping practices and production of the honey have been increased during the 10 years and at present India stands at second position in honey production after China. Along with this, the natural honey export has also increased in recent years. The beekeeping in India contributes to the economics boost up of the rural and marginalized landless farmers. Besides the economic contribution from the bees products, beekeeping enhances the pollination services assuring the crop yields and helping to maintain the natural biodiversity from the southern coast to the high Himalayans. Beekeeping gives the mutual benefits to both beekeeper and the crop farmers on the economic returns from the selling of the bee products and beehives and also increases the yields of the pollination-dependent crops by ensuring the efficient pollination services. These perspectives of beekeeping enhance the livelihoods of the farmers through the sustainable practices of beekeeping. About 20-30% of agriculture yield increases in the area, where beekeeping is in regular practice. Regarding this output, beekeeping must be in focus to government sector as well as in private sector to uplift the economic status of farmers for sustainable agriculture.

Keywords: Apiculture, Agriculture, Biodiversity, livelihood, Farmers.

Introduction

Apiculture or Beekeeping is the maintenance of bee colonies, commonly in man-made hives, by humans. Most such bees are honey bees in the genus *Apis*, but other honey-producing bees such as *Melipona* stingless bees are also kept. A beekeeper (or apiarist) keeps bees in order to collect their honey and other products that the hive produce (including beeswax, propolis, flower pollen, bee pollen, and royal jelly), to pollinate crops, or to produce bees for sale to other beekeepers. A location where bees are kept is called an apiary or "bee yard".

In India beekeeping is mostly practiced as a full-time occupation and an engrossing hobby to produce handsome income and table honey[1]. Honeybees are special gift to mankind because beekeeping can be done for both their pollination services and their cherished products such as honey, beeswax, propolis, bee venom, etc. These products have their widespread use in different small and large scale industries in India. The only bitter part of beekeeping is the bee sting. The practice of Beekeeping is an agro-based activity which is being undertaken by farmers/landless labours in rural area as an integrated farming practice. Beekeeping supplements income & employment generation and nutritional intake of rural population. Though the honeybees are best known for the honey they produce, their economic role in nature is to pollinate hundreds and thousands of flowering plants and assure setting of seed or fruit. Honeybees have been offering services to the society through ensured pollination in cross-pollinated crops as well as by providing honey and a variety of beehive products[2]. Honey Bees have vital role in sustaining plants bio-diversity resulting in environmental stability. Beekeeping is one of the thrust areas and flagship programmes of Ministry of Agriculture & Farmers Welfare. The paper is intended to focuses on apiculture and its value for sustainable agriculture in India.

The History of Honey Bee Culture

The keeping of bees dates back to 6,000 years ago, and has been traditionally for honey. In the modern era, it is more often used for crop pollination and other products, such as wax and propolis. The largest beekeeping operations are agricultural businesses that are operated for profit, though most beekeepers are non-commercial and have fewer than 25 hives. Many people have small beekeeping operations that they run as a hobby. As beekeeping technology has advanced, beekeeping has become more accessible, and urban beekeeping has become a growing trend.

Some have found that "city bees" are actually healthier than "rural bees" because there are fewer pesticides and greater biodiversity.[3] Bees and beekeeping have been subjects of vital importance in the world's agricultural literature for centuries[9]. Special Collections holds many resources that trace the history of beekeeping from the earliest published works on honeybee husbandry, such as the 1572 edition of Thomas Hill's *A pleasant instruction of the parfit ordering of Bees*[7]. Other works mark the advancement of scientific knowledge about bees. An example of this is Charles Butler's *The Feminine Monarchie: or The Historie of Bees* (originally published in 1609)[4]. Butler was among the earliest observers to recognize that worker bees were female instead of male, as was commonly believed when he first published his book in 1609 (Special Collections has the 1623 and 1634 editions)[3]. Among Special Collections historical resources on bee culture are numerous illustrated works showing the wide variety of hives and equipment that were used in India and around the world. In addition to rare books, nursery and seed trade catalogs advertising beekeepers' supplies provide glimpses into the art and craft of beekeeping.

Importance of Apiculture in Agriculture and Rural Development

Value of additional yield from pollination services by honeybees alone is about 15-20 times more than the value of all hive products put together. Honey bee pollination also improve the quality of produce. The potential benefits, due to bee pollination, in the form of increase in yields of various crops varies from 5% to 33150%[3]. The crops-wise details of increase in yield due to bee pollination are given in Table-1.

Table 1 showing crops-wise details of increase in yield due to bee pollination

Oilseeds	% increase in yields	Legume/ pulses	% increase in yields
Mustard	128.1 to 159.8	Alfalfa	23.4 to 19,733.3
Rai	18.4	Berseem and other Clovers	23.4 to 33,150
Rapeseed	12.8 to 139.3	Vetches	39 to 20,000
Toria	66 to 220	Broad Beans	6.8 to 90.1
Sarson	222	Dwarf beans	2.8 to 20.7
Safflower	4.2 to 114.3	Kidney beans	500 to 600
Linseed	1.7 to 40	Runner beans	20.6 to 1,100
Niger	260.7	Arahar	21 to 30
Sunflower	20 to 3,400	Other pulses (Arahar, etc.)	27-30 (RAU)
Orchard crops	% increase in yields	Vegetables for seed/ fruits	% increase in yields
Apple varieties	180 to 6,950	Radish	22 to 100
Pears	240 to 6,014	Cabbage	100 to 300
Plums	6.7 to 2,739	Turnip	100 to 125
Cherry	56.1 to 1,000	Carrot	9.1 to 135.4
Straw-berry	17.4 to 91.9	Onion	353.5 to 9,878
Raspberry	291.3 to 462.5	Brinjal	35-67

Persimmon	20.8	Cucumbers	21.1 to 411
Litchi	4,538 to 10,246	Miscellaneous crops	
Citrus varieties	7 to 233.3	American cotton	5 to 20
Grapes	756.4 to 6,700	Egyptian cotton	16 to 24
Squashes	771.4 to 800	Buckwheat	62.5
Guava	70-140	Coffee	16.7 to 39. 8
Papaya	22.4-88.9		
Mosambi	36-750		
Orange	471-900		

In view of the above, in addition to 4 inputs: land, labour, capital & management including seed, fertilizer, pesticides, water, machinery, etc., honey bees/beekeeping have proved to be as 5th input for agriculture which regulates the efficacy of other four inputs.

Initiatives of Ministry of Agriculture & Farmers Welfare & others

Beekeeping has been included as an activity for promoting cross pollination of Horticultural Crops under National Horticulture Mission since May, 2005, which has been merged in Mission for Integrated Development of Horticulture (MIDH). MIDH has been in implementation in all parts of the country[8]. Under MIDH, among others, assistance for promoting Scientific Beekeeping under the component of 'Pollination Support through Beekeeping' is available and being implemented by the State Departments of Horticulture/Agriculture in the field. Khadi and Village Industries Commission, Ministry of Micro, Small and Medium Enterprises, State Khadi Board etc. are also implementing beekeeping schemes.

Role of National Bee Board in Apiculture Industry (NBB)

The main objective of NBB is overall development of beekeeping by promoting scientific beekeeping in the country to increase the productivity of crops through pollination support and production of honey and other beehive products to increase the income of farmers/beekeepers. NBB is one of the National Level Agencies (NLAs) under MIDH.

Presently, the main thrust of NBB is setting up of Integrated Beekeeping Development Centres (IBDCs)/Centres of Excellence (CoEs) on beekeeping, at least one in each State. In these centres (IBDCs), requisite infrastructural facilities for implementing end to end approach for development of scientific beekeeping in the country may be made available at one place. Centres will help the beekeepers/farmers of the area in adopting scientific beekeeping and encourage/promote scientific beekeeping in integrated manner in the Country. 3 IBDCs have been commissioned/approved during 2015-16 and 7 are in process[6].

Apiculture Industry in India

Presently, about 30 lakhs bee colonies in India are producing 94500 metric tonnes of Honey (2016-17 estimated) including honey from wild honey bees & providing employment to about 3.00 lakh persons[5]. India is one of the honey exporting countries. The major markets for Indian honey are Germany, USA, UK, Japan, France, Italy, Spain etc.

International scenario of Apiculture (beekeeping)

Honey is the precious natural health product which is produced throughout the world. A total quantity of 14-15 lakh metric ton is produced world over. There are 15 countries in the world which produce 90% of the total production. Major honey producing countries are China, USA, Mexico, Argentina, Ukraine, Turkey, Russia & India[4].

Apiculture as an Enterprise, source of Livelihood and benefits

Apiculture industry is source of livelihood for rural poors/tribals/forest based population. Benefits of apiculture are summarized as under:-

- ✓ Unemployed youth can start this business with minimal funds (Rs. 1.00 to 2.00 lakhs);
- ✓ Generates 3.75 lakhs mandays to maintain 10,000 Bee colonies in Bee hives;
- ✓ Proper utilization of natural resources – nector & pollen otherwise go waste;
- ✓ Different sectors and trades benefit from a strong beekeeping industry;
- ✓ Beekeeping encourages ecological awareness;
- ✓ Beekeeping helps in increasing National income;
- ✓ Income from 100 Bee colonies is around Rs. 2.50-3.00 lakhs per annum;
- ✓ May help in doubling farmers income by supplementing/complimenting agriculture/ horticulture;
- ✓ Export of honey/beehive products attracts foreign exchange;
- ✓ It helps in rural development and promotes small village industry;
- ✓ Beekeeping is benign: Beekeeping generates income without destroying habitat;
- ✓ Encouraging beekeeping encourages biodiversity.

Hence, beekeeping may be adopted as an enterprise by anyone after getting training on the subject.

Potential and Opportunities

India has vast potential for Beekeeping. The diversity in flora and fauna provides more opportunities for the development of beekeeping industry[10]. The National Commission on Agriculture had visualized the need for deploying about 150 million Bee colonies for pollinating 12 major agricultural crops in the country. Presently, 200 million Bee colonies are required for enhancing their yield which will provide employment to 215 lakh persons and produce 10 million tonnes of honey and increase in crop production[6].

Conclusion

Apiculture has always been a mean of source of income either by selling bee products or getting profit from pollination of farmer's crop[5,6]. The main issues to be conveyed are strengthening of National Bee Board, setting up of State Bee Boards/Missions/IBDCs; production of quality germplasm & nucleus stock of honey bees; indiscriminate use of pesticides in crops; quality standards for honey & other beehive products by BIS/ FSSAI, etc.; disease diagnostic labs & bee products quality analysis labs; exemptions from various taxes for Beekeeping/beekeepers; treating beekeepers as farmers in all respects for compensation, etc. in the event of damage of bee colonies and accidental insurance coverage on subsidized rates, insurance of bee colonies on subsidized rates, etc. All these things may settle apiculture for sustainable agriculture.

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