

Pollination Service and Beekeepers of West Bengal: A Case Study at North Dinajpur District

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Abstract: For long time people have not been seeing insects like bee, butterfly, dragonfly and so others. Most responsive reasons behind it are huge pressure of urbanisation, rapid industrialisation, unscientific usages of pest control materials in farms and few others. But almost all people know that these small insects are very much helpful for pollination. It is striking to think that three-quarters of our important food crops need bee pollination. It is estimated that 80 percent of flowering plants are insect dependants for their pollination activities and half of the pollinators of tropical plants are bees. The present study is aimed to know the position of beekeepers of West Bengal for providing pollination service. This study also wants to identify the external problems which are associated with beekeepers of West Bengal for providing this pollination service. The article goes in the following way – Introduction, Methodology, Limitation, Reasons for selecting this area as a case, Present Situation for providing Pollination Service: World Vs India, Result and Discussion, and Conclusion.

Keywords: Bees, Beekeepers, Farmers, Harassments, Pollinators, Pollination service

I. INTRODUCTION

For long time people have not been seeing insects like bees, butterfly, dragonfly and so others. Huge pressure of urbanisation, rapid industrialisation and uncontrolled usages of pesticides, parasite and insecticides are changing our environment into this crucial situation. But almost all people know that for pollination these small insects are very much helpful. It is known to all of us that pollination is the process of transfer of pollen from the anthers (male part of a flower) to the stigmas (female part of a flower), either on the same plant or on a separate plant that may be situated at a distance place [1],[2]. The most of these pollen transfer activities are happened by these insects. But people do not care about these insects and their activities. Moreover people who keep bees are hackled in various fields by general people. All are not conscious about bees those help to accelerate these pollination activities [3]. It is important to note that three-quarters of our important food crops need bee pollination. A world without bees would be serious; most flowering plants would die out, followed by the animals those eat them [4]. It is estimated that 80 percent of flowering plants are depending more or less on insect pollination. It is interesting that half of the pollinators of tropical plants are bees [5],[6]. In United States 80 per cent of the bee colonies are used for planned pollination of various crops. In California, about two and half lacs acres of land are under almond cultivation. As per statisticians California needs three bee colonies per acre to pollinate all the flowers of almond. California State has only about three lacs honeybee colonies. About four lacs honeybee colonies are brought to California from adjacent States during the flowering of almond [2]. Agricultural scientists have

estimated that India needs minimum 75 lacs bee colonies just to pollinate and increase productivity of 12 major crops which are entomophilous and are dependent on insects like honey-bees for pollination [2],[7]. So it is found that a new opportunity is coming in front of beekeepers for providing pollination service in agriculture and horticulture farms.

The present study is aimed to know the position of beekeepers of West Bengal in providing pollination service. This study also wants to identify the external problems associate with beekeepers of West Bengal for providing this pollination service.

II. METHODOLOGY

Present study is based on secondary as well as primary data. Different literatures, books, journals are available in India and abroad which are mainly about bees, honey, bee waxes and other bee products. But literatures about pollination service by bees and modern beekeeping is rarely available. To discuss the present world situation in pollination services by beekeepers, including India, the secondary data are used. Primary data are collected by using stratified sampling technique. Beekeepers move with their bee colonies in different fields throughout the year. Honey bees collect pollens and nectars from flowers. Since in different seasons different flowers are blossomed in different areas, the beekeepers move according to flower blossom seasons. In rainy season they stay at home and keep the bees with artificial feeding. They supply sugar syrup for this feeding. Since it is a migratory profession, it is difficult to collect primary data from beekeepers of West Bengal. It will be better if the targeted area to collect primary data is the highest honey flow area and targeted period is the highest

honey flow season. Hence, few parts of North Dinajpur District are used as sample survey area (i.e. strata). Kaliyaganj, Hemtabad, Itahar and Raiganj, these four blocks of North Dinajpur District are included as survey areas. All beekeepers those have come these locations are under interview. No one is eliminated from this interview process. In the survey areas only 42 beekeeper respondents of West Bengal are available. Questionnaires are made in this way so that an idea can obtain on pollination service and about consciousness towards bees as well as beekeeping in the mind of general people, farmers, land owners and others. In-depth study is needed in future. In this survey, at first beekeeper respondents have been asked – Does bee involve in pollination? Do the farmers or farm-owners call you for providing pollination service by keeping bee-colonies in their field? If “yes” then tell – what amount do you earn from this pollination service? Again the beekeeper respondents have been asked about their various external problems created by other stakeholders of society in their beekeeping profession. After taking this answer they have been asked which one is the major problem among various external problems. The data thus obtained are studied statistically and the inferences are made accordingly.

III. LIMITATION

Study is conducted only in the four blocks of North Dinajpur District -Kaliyaganj, Hemtabad, Itahar and Raiganj. The period of study is started from December, 2017 to January, 2018.

IV. REASONS FOR SELECTING THIS AREA

Major honey flow areas of West Bengal are situated in these three districts- Malda, North Dinajpur and South Dinajpur. Optimum honey flow period is started from December of every year to next year March. Most of beekeepers from different districts of West Bengal come in this field every year in this period for collecting mustard honey which has greater demand not only in national markets but also in international markets.

V. PRESENT SITUATION FOR PROVIDING POLLINATION SERVICE: WORLD VS INDIA

In many local communities in different parts of the world, beekeeping is perceived by many farmers as being important for their own crop production. This is because they are well aware of the pollination services that bees can perform on their crops. In addition, small-scale farmers who have apiary can offer pollination services to other farmers in their area. Thus, there is huge scope for increasing their income from the pollination services which can be generated by the apiculture activities [8]. This main service provided by bees remains poorly appreciated and underestimated in most countries [5]. Until mid-20th century, honeybees were equated with the production of honey and beeswax. But since past 3-4 decades, utilizing honeybees to pollinate large number of agricultural and horticultural crops to increase per acre yield has become a routine practice in many developed countries [7]. Agricultural scientists in United States have estimated that the value of the increased crop yields through bee

pollination is ten to fifteen times more than the value of the honey and beeswax produced by honey bees [7]. In USA, scientists have attempted to measure the value of increased yield and quality of crops achieved by honeybee pollination. During the year 2000 in USA, this has been estimated to be worth around US\$14.6 billion [5]. Use of bees for pollinating crops, to a certain degree, developed in Europe, North America, Australia, Japan and New Zealand. But in many countries (also in Europe) the bees are not used effectively partly owing to the lack of knowledge and partly because of the fact that the hives being big and heavy, are difficult to transfer to a field [5]. The beekeepers of United States prefer to provide bee colonies on rental basis for pollination service to farmers and orchardists rather than for honey production [7]. A report published in 2014 by United States Department of Agriculture (USDA) regarding top ten Sources of pollination fees in U.S. during 2012, states that total fees collected by pollination service is 656079383 US \$ (Table: 1). In case of California, beekeepers in California earn about \$150 per bee colony per month as a rental for providing bee colonies for pollination service [7].

Table 1: top ten sources of pollination fees and shares in U.S. during 2012

Crop	Pollination fees charged (in US dollars)	Proportion of total collected fees (in %)
Almonds	292,500,000	44.6
Sunflowers	110,460,000	16.8
Canola (Seed)	108,927,000	16.6
Grapes	43,294,500	6.6
Apples	23,601,600	3.6
Sweet cherries	13,452,450	2.1
Watermelons	10,462,500	1.6
Dried prunes	8,525,000	1.3
Cultivated blueberries	8,215,200	1.3
Avocados	7,446,000	1.1
Total top 10	626,884,250	95.6
Other crops	29,195,153	4.4

Source: [9].

Dr. B.L. Sarswat, Executive Director, NBB, has shown the potential benefits due to bee pollination in India, in the form of increase in yield, in various orchard crops, miscellaneous crops and vegetables (Table: 2) and in various oilseeds and legume crops (Table: 3) due to bee pollination. But in India pollination service is not popular to the beekeepers and to the farmers. Farmers are trying to increase their crops by applying modern technology, fertilizers, insecticides etc. But they forget about the services of pollinators especially bees. In Malda mango farmers think that bees spoil mango buds thus their trees are losing productivity (field survey). Like farmers of Malda, many farmers of different areas in West Bengal believe this ‘wrong idea’. In some countries farmers or crops’ owners pay some money to the beekeepers for pollination service. But in West Bengal, the beekeepers are prohibited to keep their colony in the different fields. Moreover it has been reported that without giving money to the local forest protection committees, beekeepers cannot be allowed to keep their bee colonies in the jungle of Eucalyptus of West Midnapure and Bankura districts of West Bengal (field survey).

Table 2: potential benefits due to bee pollination in India, in the form of increase in yield, in various orchard crops, misc. crops and vegetables

Orchard crops	% increase in yields	Vegetables	% 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 1000	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 to 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 to 140	Coffee	16.7 to 39.8
Papaya	22.4 to 88.9	This increase in yield is in addition to value honey and other hive products. Bee pollination results not only in yield increase but also improvement in quality of produce.	
Mosambi	36 to 750		
Orange	471 to 900		

Source: [10].

Table 3: potential benefits due to bee pollination in India, in the form of increase in yield, in various orchard crops, misc. crops and vegetables in various oilseeds and legume crops

Oilseeds	% increase in yields	Legume seeds	% increase in yields
Mustard	128.1 to 159.8	Alfalfa	23.4 to 19,733.3
Rai	18.4	Vetches	39 to 20,000
Rape	12.8 to 139.3	Board Beans	6.8 to 90.1
Toria	66 to 220	Dwarf beans	2.8 to 20.7
Sarson	222	Kidney beans	500 to 600
Sufflower	4.2 to 114.3	Runner beans	20.6 to 1,100.1
Linseed	1.7 to 40	Other pulses (Pigeon pea- 21 to 30%, etc.)	28.7 to 73.8
Niger	260.7	Berseem and other Clover	23.4 to 33,150
Sunflower	20 to 3,400		

source: [10]

VI. RESULTS AND DISCUSSION

In this study (Table: 4) it has been revealed that till now one beekeeper out of 42 beekeepers does not know about this pollination service. Though percentage is very low (2.38%) but it is not wise that the beekeepers those safe the industry as a main pillar, are not entirely aware about this service. Moreover it has also revealed that there is no farmer or farm-owner who offers to a beekeeper for providing pollination service by keeping bee-colonies in his farm. It is also needed to bring consciousness about bees and pollination services among farmers, farm-owners and even among the general people.

In the survey (Table:5) (Figure:1) it has also revealed that 57.14 % Beekeepers are not allowed to keep their bee-box in the farmers' or landlords' fields at any cost and 21.44 % Beekeepers are allowed to keep their bee-box in the farmers' or landlords' fields by pay some money and/or honey. Where beekeepers of other countries like USA, Argentina are getting charge of huge amount for pollination service, our beekeepers are not allowed to keep their bee-boxes in the fields. Even sometimes they are allowed but have to pay charges. Members of local club, member of local authority and even local dada (2.38%) are levied some honey and/or money. During migration from one field to other fields within different districts of West Bengal the beekeepers (9.52%) are also harassed by traffic police. Since they have to journey with their bee boxes after evening and before dawn i.e. at night, they compel to pay that amount which is demanded by the traffic police. The policemen treat this activity like other goods carriage. This attitude should be removed immediately. Since, farmers have no knowledge about benefits of this pollination activity for their crops; they are applying pesticides, parasite and insecticides haphazardly without considering the lives of bees. Here also 9.52% beekeepers have faced these problems which are created by uncontrolled pest management system. General people also have no consciousness on this matter. By adopting unscientific way of living they are damaging bees' pasturages and their lives.

Table 4: concept about pollination, pollination service and earning there from by the beekeepers of West Bengal

unit: no of respondents and (% of that)

Question	Yes	No	Not Answered
Does bee involve in pollination?	41 (97.62%)	1 (2.38%)	0
Do the farmers or farm-owners call you for providing pollination service by keeping bee-colonies in their field?	0	42 (100%)	0
If "yes" then tell – what amount do you earn from this pollination service? (in Rs)	Does not arise		

Source: field survey during 2017-18
No of respondents 42

Table 5: single major problem out of all external problems has been facing by the beekeepers during migration in different fields of West Bengal

One Major Problem among other External Problems which has been facing by beekeepers	Beekeeper Respondents	
	In Number	In %
Not allowed to keep his bee-box in the farmer's / owner's farm	24	57.14
Allowed to keep his bee-box in the farmer's / owner's farm by paying some charges	9	21.44
Harassment by local club or authority near the field	1	2.38
Harassment by traffic police during transportation from one field to another	4	9.52
Damage of bee population by applying unscientific pest management by farmers	4	9.52
Total no of Beekeepers respondent	42	

Source: field survey during 2017-18
No of respondents 42

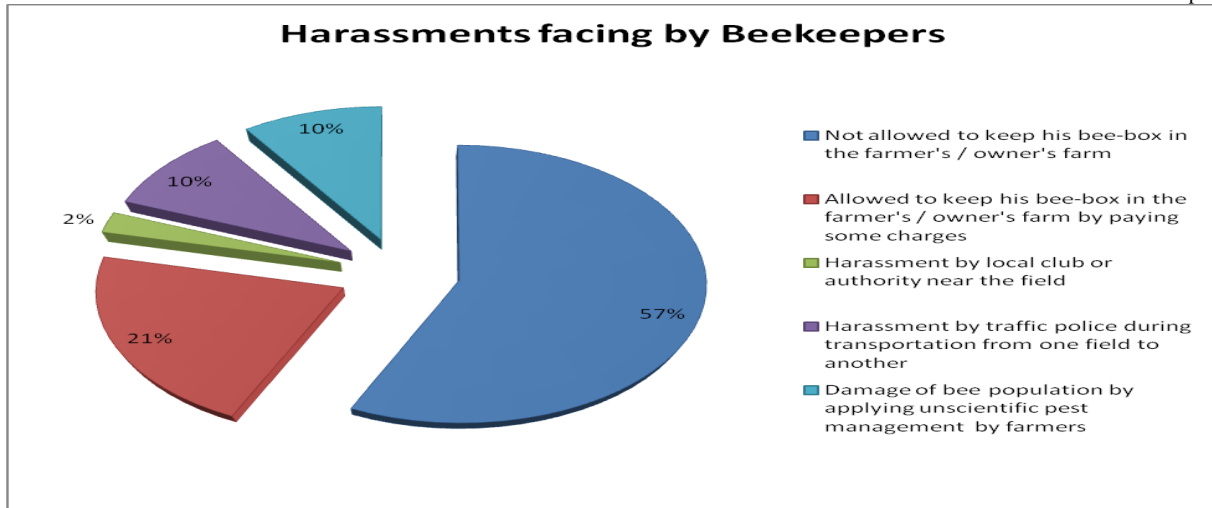


Figure 1: single major problem out of all external problems has been facing by the beekeepers during migration in different fields of West Bengal

Source: field survey during 2017-18
No of respondents 42

VII. CONCLUSION

The main service, pollination, which is provided by bees remains poorly appreciated and underestimated in most countries. Use of bees for pollinating crops, to a certain degree, developed in Europe, North America, Australia, Japan and New Zealand. But, like many other countries, in India the bees are not used effectively purely owing to the lack of knowledge. In this study, it has been revealed that till now 2.38% beekeepers does not know about this pollination service. Though percentage is very low, it is not practical. Moreover it has also revealed that there is no farmer or farm-owner who offers to a beekeeper for providing pollination service by keeping bee-colonies in his farm. It has also revealed that maximum beekeepers are not allowed to keep their bee-box in the farmers' or landlords' fields at any cost. A substantial portion of beekeepers are allowed to keep their bee-box in the farmers' or landlords' fields by pay some money and/or honey. Members of local club, member of local authority, local dada and traffic police are also levied some honey and/or money. Beekeepers also have faced these problems which are created by adopting irrational pest control process by farmers and general people. Hence it has been concluded that the pollination service providers, bees and beekeepers, are in trouble. In one hand the farmers and land owners are always trying to prohibit beekeepers to keep the bee-box in their farms. On the other hand the Beekeepers of West Bengal are harassed by some other members of society like club members, members of local body, policemen and even general people. Application of uncontrolled pest management methods in the agriculture and horticulture

field is very crucial at present. It is to be said that no one in the society of West Bengal has any consciousness about this pollination service. Following suggestion may be given to remove these hindrances -

- Special Awareness programme have to be conducted to popularise pollination service among the general people especially among the farmers and farm owners.
- Special Awareness and motivating camps as well as beekeeping training programmes and beekeeping projects have to be introduced at school level.
- Policy should be adopted to introduce integrated pest management system so that agriculture and beekeeping both can sustain.
- Government, forest department, non government organisation, apiculture cooperative societies have to take action immediately whenever the beekeepers face any obstruction to keep their colonies in the fields.
- A separate beekeeping institution should be established at state level that can support these beekeepers all time. A beekeeper's card should be issued and mobile networking should be ran so that the institute can know the immediate problems in the fields and can take action promptly.
- All beekeepers have to register under National Bee Board.

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