

IS WEST BENGAL READY TO GET POLLINATION SERVICE FROM DOMESTIC BEES?

A SURVEY ON BEEKEEPERS WHO HAVE COME IN THE MUSTARD FIELDS OF NORTH DIANJPUR AND MALDA DISTRICTS

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Abstract : In the coming decades for population explosion India and even world will have to face a most significant challenge that is to provide enough nutritive food to all people. In this crucial situation the world also has experienced an exceptional decrease in insects' population. A dangerous situation has come in environment. Who will pollinate one flower with another flower? How will produce crops? It is the time to warn about this matter to all. We have to over conscious about our nature. On the other hand, human beings can't tame other insects but can tame bees. Domesticated bees can become a good and effortlessness pollinator in this present crisis situation. Hence other stakeholders of the society have to be sympathetic towards these poor beekeepers who are always trying to collect honey, wax and other bee-products for maintaining their livelihood and at the same time that provide pollination service automatically and simultaneously which helps to supply foods for us and to sustain our environment. The present study is aimed to know the scope 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; Material and Methods; Taming of Bees and Its New Leeway; Result and Discussion; and Conclusion. After studying the case it can be concluded that no one has any consciousness about the pollination service of beekeepers. At the end few suggestions have been given to overcome the problems relating to pollination service by beekeepers.

Index Terms- Bees, Beekeepers, Pollinators, Pollination service, Taming of Bees.

I. INTRODUCTION

In the last few decades the world has experienced an exceptional increase in population and by 2050 AD, world population is estimated to grow to between 900 and 1000 crores people. The world has made significant progress in raising food consumption per capita. It has increased from an average of 2280 kcal/person/day in the early 1960s to 2800 kcal/person/day today. Statisticians have also estimated that by 2030 AD the population of India will be about 140 crores. For this population explosion India and even world will have to face a most significant challenge in the coming decades that is to provide enough nutritive food to all people[1],[2]. In this crucial situation the world also has experienced an exceptional decrease in insects' population. It is noticeable that from few decades the population of pollinators like bees, butterflies, dragonflies and so others are decreasing day by day.

It is interesting that for agricultural production besides the four basic production inputs (land, labour, capital and management) another input is most significant that is pollinator. Pollinators help to pollinate the maximum flowers of this planet Earth. But general people and even government are always trying to

improve qualities and quantities of these basic production inputs by adopting policies, giving subsidies and so many. The fifth production input the pollinator remains as worthless input in the mind of general people and even government. People know this input but don't feel its benefit.

These small and hard-working insects actually make it possible for many of our favourite foods to reach our table. Bees are one of a myriad of other animals, including birds, bats, beetles, and butterflies, called pollinators. Cross-pollination helps at least 30 percent of the world's crops and 90 percent of our wild plants to prosper [3]. But this main service provided by bees remains poorly appreciated and underestimated in most countries [4]. 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 [5]. 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 [6].

II. MATERIAL AND METHODS

Present study is based on secondary and primary data. To discuss the present situation of world and India about pollination services by bees and its future, the secondary data are used. Primary data are collected by using stratified sample. Few parts of North Dinajpur district and few parts of Malda district are used as sample survey area. Kaliyaganj, Hemtabad, Itahar and Raiganj, these four blocks of North Dinajpur district and Bamangola, Old Malda, Gazole and Habibpur, these four blocks of Malda district are included in the survey areas. Only 42 and 78 beekeeper respondents of West Bengal are available in North Dinajpur and Malda districts respectively. They are 120 numbers in total. 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.

The study is limited to these eight blocks of West Bengal- Kaliyaganj, Hemtabad, Itahar and Raiganj and Bamangola, Old Malda, Gazole and Habibpur. The period of study is started from December, 2017 to January, 2018.

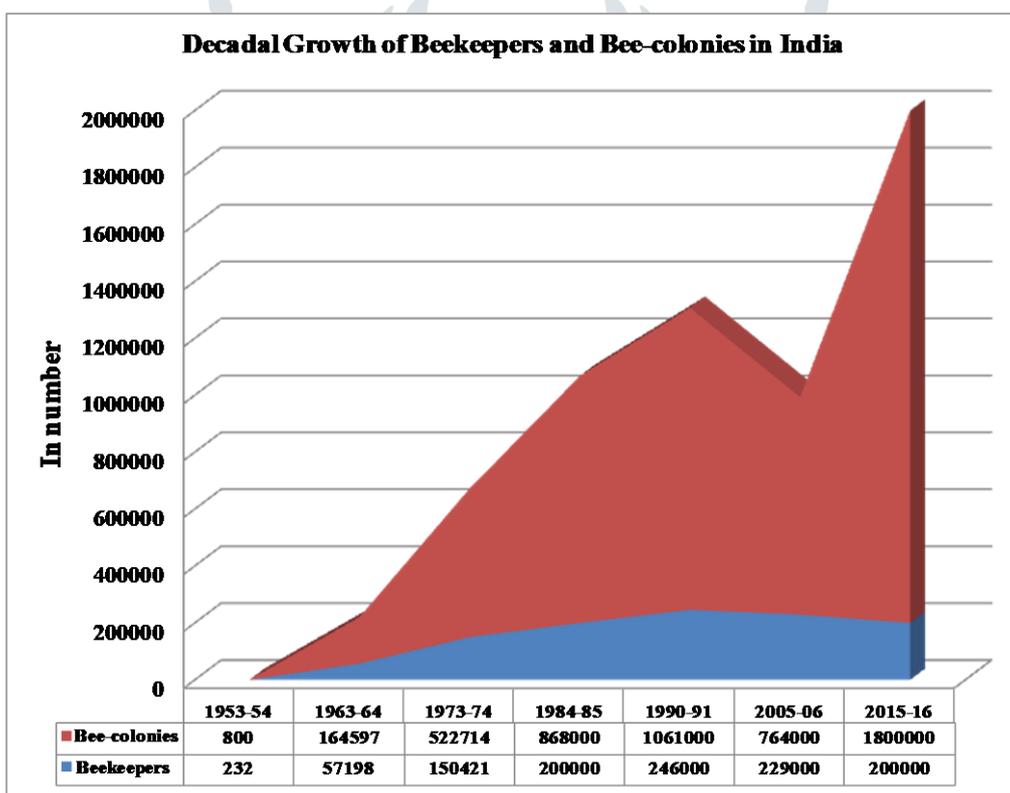
Major honey flow areas of West Bengal are situated in the three districts- Malda, North Dinajpur and South Dinajpur. Optimum honey flow period is started from every year December to next year March. Most of beekeepers from different districts of West Bengal come in these fields every year in this period for collecting mustard honey which has greater demand in national as well as international markets. Moreover mango and litchi honey are also available in the fields of these two districts.

III. TAMING OF BEES AND ITS NEW LEEWAY

Bees is the only insect that can be tamed easily by any person like man or woman, employed or unemployed, fresher or retired, schoolchild or teacher, normal or partially disabled, land owner or land less people and even also you or your spoue. Anyone maintains bees locally for his own needs but its benefits can be spread globally. For one bee colony only 1 by 1 square stride of land is needed and doesn't require any extra labour. Anyone can tame without involve his extra efforts. He can do it with his other profession. Honey bees fly and collect nectar and pollens from flowers which are situated within about 3 to 10 kilometres radios from bee box. So bees collect huge amount nectar and pollens which might be destroyed in the field every day. Even today maximum amount of nectar are destroying on the branches of plants. During nectar collection pollination has been occurred by bees. Any particular tamed bee can't collect

nectar only from flower of his master’s farm. The bees collect it from any flower. Though tamed by a master, a bee can help huge number of people who are not domesticated that particular bee. Moreover plant, biodiversity and overall environment can sustain by the help of bees through their pollination activities.

Honeybees are only insects that collect nectar, convert it into “Honey” and save it for future. For this reason human beings are interested from ancient time to collect and produce honey indirectly by keeping “Honeybees”. For producing and collecting honey, keeping of honeybees is called “Beekeeping”. Beekeeping is also known as “Apiculture”. This industry is an Eco-friendly industry. This industry does not create any environmental hazard during any stage of production, value addition even at the time of consumption. Even it can be said that this industry helps to create green environment. In beekeeping China, USA, Argentina, Ukraine, Mexico, Russian Federation, India, Australia, Japan, New Zealand, Ethiopia, Canada, Israel, Brazil, Italy, Greece, Germany and Spain are more popular. There are about 4 crore bee colonies in the world. The United States have about 50 Lakhs bee colonies, The USSR has about 55 lakhs and China has 1 crore bee colonies. Few decades back China had 60 lakhs bee colonies. Now they have 1 crore bee colonies and have a plan to increase this number to 5 crores in next few decades. To achieve this target China has taken on a big scale forestation, road-side plantation and other programmes to increase bee-flora and have a timber for manufacturing large number of bee-boxes to hive bee colonies[1]. India also has needed to increase bee population. It is estimated that India has Potential and requirement for 200 million bee colonies[7]. Now, more than 2 lacs peoples of India have taken beekeeping profession for their livelihood and are maintaining around 9 bee-colonies per beekeepers. Figure 1 shows the decadal growth of beekeepers and bee-colonies in India.



source: [7],[8],[9].

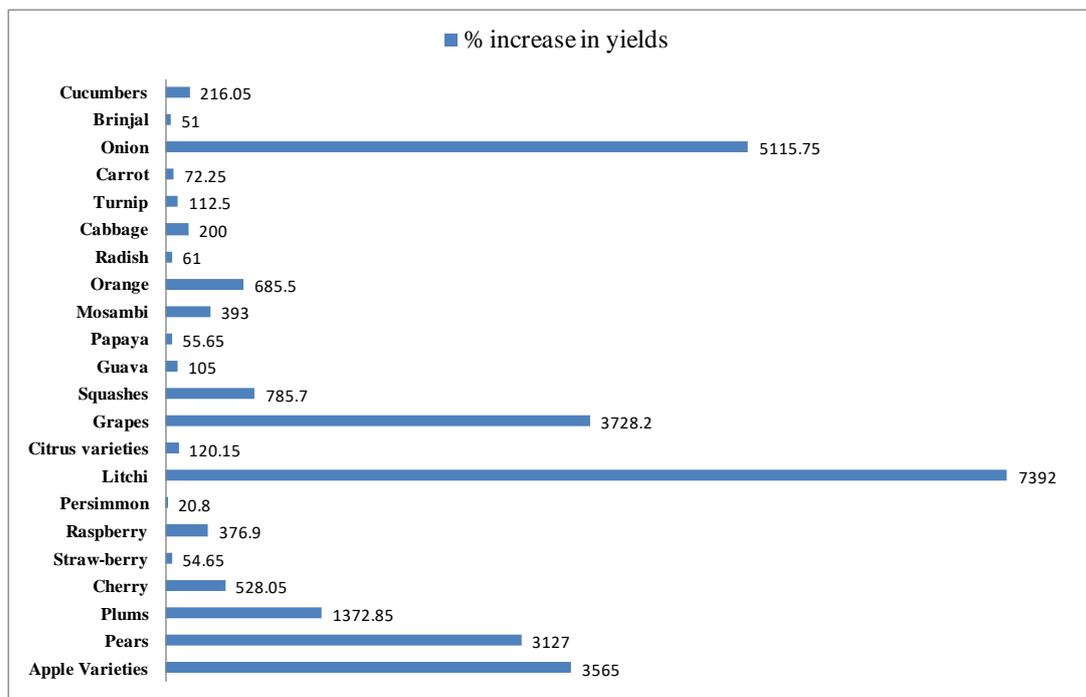
figure 1: decadal growth of beekeepers and bee-colonies in India (units in number)

Human beings are always ignoring the pollination service of these domesticated bees for its unaccountable service. It is impossible to assess financial value of bee pollination on plants and its contribution to maintain of biodiversity. Other assets created by beekeeping such as honey and beeswax are far more tangible, but their value must be far less than the wealth created as a result of optimal pollination of plants[4],[10],[11]. It is important to note that three-quarters of our important food crops need bee pollination. A world without bees would be fatal; most flowering plants would die out, followed by the animals those eat them[3]. It is

estimated that 80 percent of flowering plants are entomophilous i.e. depending more or less on insect pollination and it is also estimated that half of the pollinators of tropical plants are bees[2],[4]. Honeybees are highly efficient pollinating insects, because[1],[5],[10]:

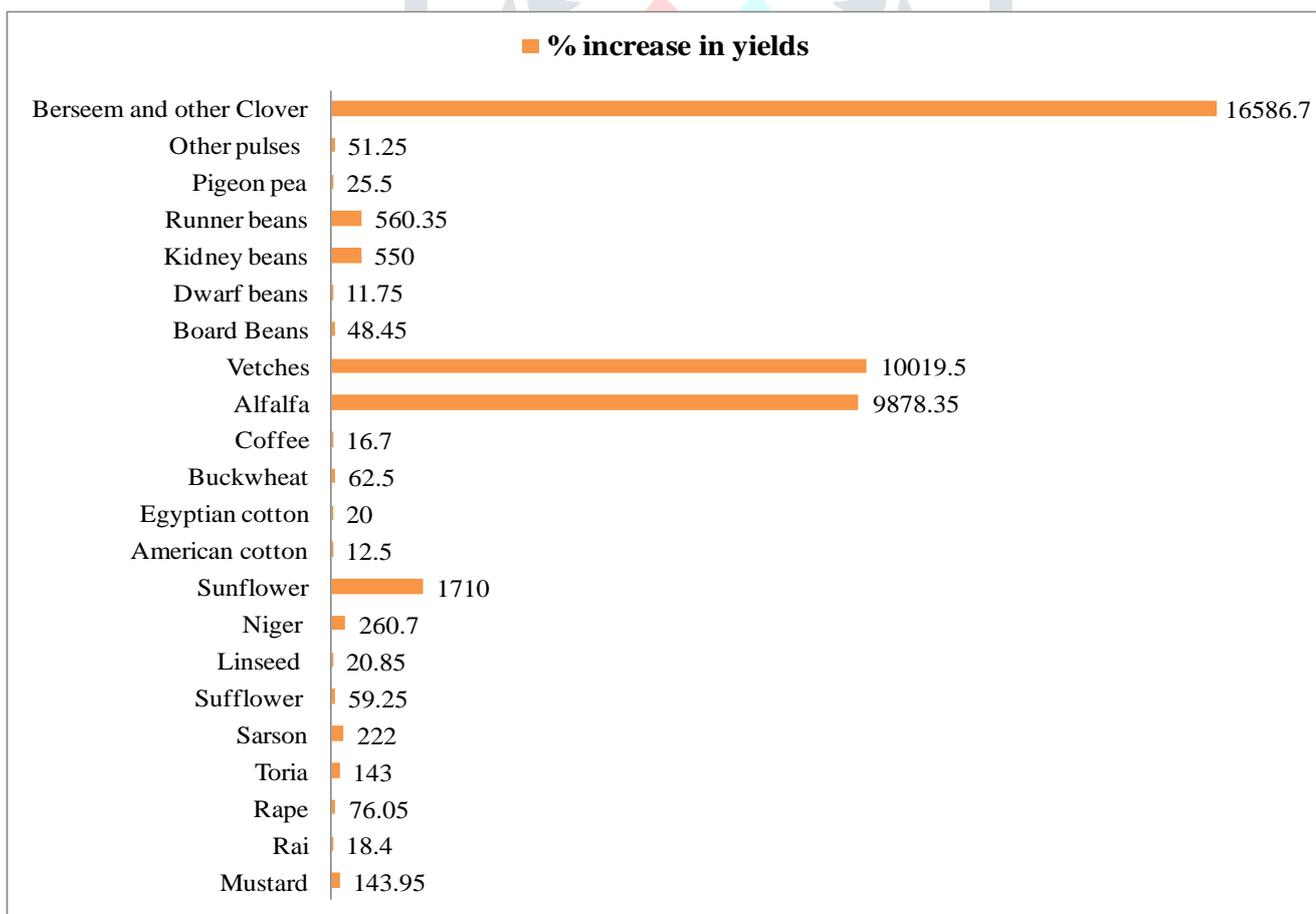
- they have hairy bodies that easily pick up thousands of grains of pollen as they move about inside the flower
- they visit only one species during each foraging trip
- each foraging bee not only collects sufficient food for its own requirements, but continuously forages for nectar and pollen to supply the daily food needs of the colony
- During a single day, one bee may visit several thousand flowers of one plant species, collecting nectar and pollen and continuously transferring pollen grains from one flower to another

People like bees for honey and wax but don't like those beekeepers who keep bees in various fields. Beekeepers are hackled in various fields by general people. All are not conscious about bees those help to accelerate these pollination activities. 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[5]. 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 [1]. 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 [4]. Use of bees for pollinating crops, to a certain degree, developed in Europe, North America, Australia, Japan and New Zealand. 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[5]. 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 from almonds, sunflowers, canola seed, grapes, apples, sweet cherries, water melons, dried prunes, cultivated blueberries and avocados are 626884250 US \$ and from other crops are 29195153 US \$[12]. 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[5]. In June 2002, data has published about the beneficial effect of honeybees for coffee pollination in Panama, coffee bean production is increased by 50 percent[4]. 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[4]. 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[1],[2]. So it is observed that a new opportunity is coming in front of beekeepers for providing pollination service in agriculture and horticulture farms. Dr.B.L.Sarswat, Executive Director, National Bee Board, (2015), has shown the potential benefits due to bee pollination in India, in the form of increase in yield, in various orchard crops and vegetables (figure: 2) and in various oilseeds, legume crops and miscellaneous crops (figure: 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).



source: [7].

figure 2: potential benefits due to bee pollination in India, in the form of increase in yield, in various orchard crops and vegetables (unit in %)



source: [7].

figure 3: potential benefits due to bee pollination in India, in the form of increase in yield, in various oilseeds, legume crops and misc. Crops (unit in %)

IV. RESULTS AND DISCUSSION

In this study (figure: 4) it has been revealed that till now few beekeepers do not know about this pollination service. 15% beekeepers have remained silent and 3% beekeepers have answered that bees don't involved pollination. It is unfortunate to know that the beekeepers those save the industry as a main stake, are not fully alert. 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. All 120 beekeepers say that no the farmer or farm-owner calls him for providing pollination service by keeping bee-colonies in their field. It is also needed to bring consciousness among farmers, farm-owners and even among the general people about bees and pollination services.

In the survey (table:1) it has also revealed that 48.34% Beekeepers are not allowed to keep their bee-box in the farmers' or landlords' fields at any cost and 19.17% 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 or are sometimes allowed but have to pay charges. Members of local club, member of local authority, local dada (together 5%) are levied, mainly honey, to the beekeepers for keeping bee boxes in their locality. Policemen (5%) also are levied, mainly money, during migration from one field to another. 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. 19.17% beekeepers have faced the problems which are created by uncontrolled usages of pesticides, parasites and other pest control materials. General people also have no consciousness on this matter. By adopting unscientific way of living they are damaging bees' pasturages and their lives. 1.67% beekeepers have argued on this matter. 1.67% beekeepers have noticed their profession is effected by the climate change. They feel that flowers don't blossom in time and don't dwell in fields as before.

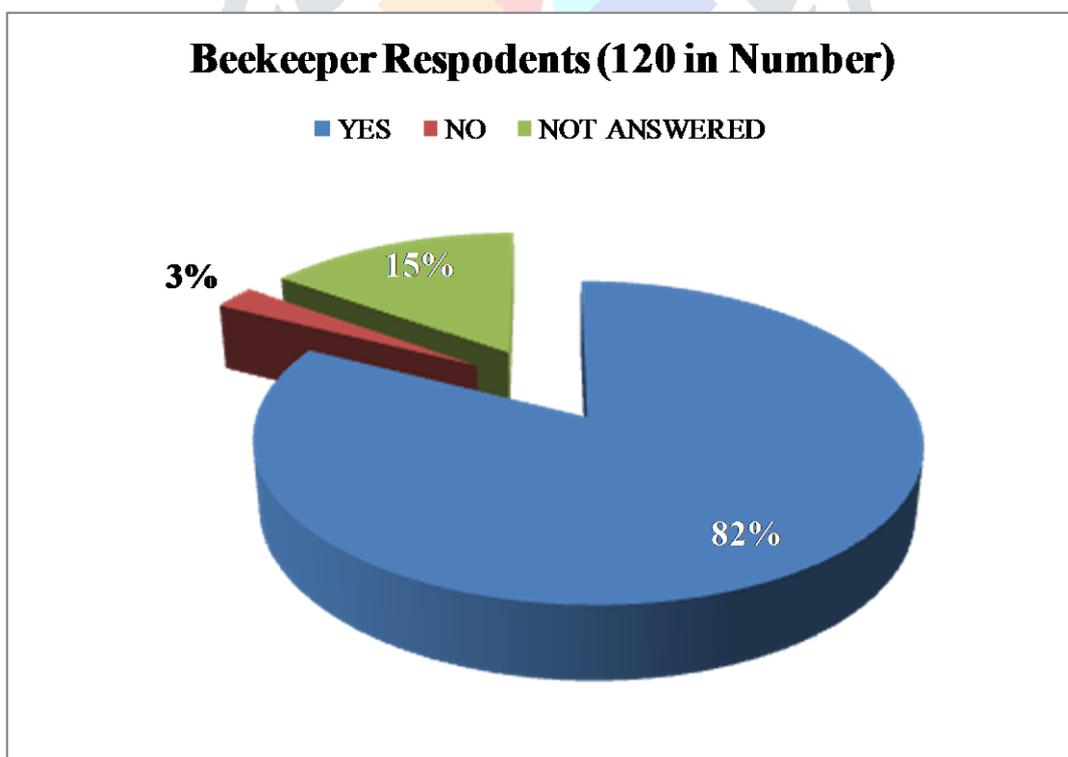


figure 4: concept about pollination, pollination service to the beekeepers of West Bengal

source: field survey during 2017-18
no of respondents 120

table 1: single major problem among 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 is facing by beekeepers | Beekeeper Respondents | |
|--|-----------------------|-------|
| | In Number | In % |
| Not allowed to keep his bee-box in the farmer's / owner's farm | 58 | 48.34 |
| Allowed to keep his bee-box in the farmer's / owner's farm by paying some charges | 23 | 19.17 |
| Harassment by local club or authority near the field | 6 | 5 |
| Harassment by traffic police during transportation from one field to another | 6 | 5 |
| Damage of bee population by applying unscientific pest management by farmers | 23 | 19.17 |
| Reduction of bee pasturages by deforestation, urbanisation and pollution | 2 | 1.67 |
| Effect due to climate change | 2 | 1.67 |
| Total no of Beekeepers respondent | 120 | |

source: field survey during 2017-18
no of respondents 120

V. CONCLUSION

Many farmers in different parts of the world are well aware about the pollination services. They know that bees can perform on their crops. But this main service provided by bees remains poorly appreciated and underestimated in most countries. Here already mentioned that 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, the bees are not used effectively in India purely owing to the lack of knowledge.

In this study it has been revealed that till now few beekeepers do not have perfect idea about this pollination 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. Not only that they are always trying to prohibit beekeepers to keep the bee-box in their farms. Beekeepers are also always facing some other problems which are created by some other members of society like club members, members of local body, policemen and even general people. Application of uncontrolled pest management system is very crucial among them. By studying these it can be concluded that no one has any consciousness about this pollination service.

It has been seen in Midnapur District of West Bengal (field survey). There small children of farmers' family are engaged in hand pollination job in their own farms. It is found that these crops are mainly pumpkin and snake gourd (Chichinga). They pluck male flowers from plant and touch with the female flowers for pollination. As they think that labour of these little children have no cost, the production costs of their products remain same. If opportunity cost is employed, this process cannot be a viable one. Then production cost would be higher than the product's market price. Similarly it has also noticed that the farmers of pointed gourd (Patol) cull the male flowers and mix with water in a bucket. These male pollens mixed water then spray to the other flowers of pointed gourd for pollination. Not only in Midnapur it also has come in South and North 24 Parganas districts.

A dangerous situation has come in environment. It is the time to warn about this matter to all. We have to over conscious about our nature. On the other hand, human beings can't tame other insects but can tame bees. Domesticated bees can become a good and effortlessness pollinator in this present crisis situation. Hence other stakeholders have to be sympathetic towards these poor beekeepers who are always trying to collect honey, wax and other bee-products for maintaining their livelihood and at the same time they provide pollination service automatically to sustain our environment. Following measure may be adopted to overcome these problems-

- Special Awareness programme have to be conducted to popularise pollination service among the general people especially among the farmers and farm owners.

- Pollination service training programme should be conducted among the beekeepers.
- 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.
- Special Awareness and motivating camps as well as beekeeping training programmes and beekeeping projects have to be introduced at school level.

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