

Appraising the Beekeepers Knowledge and Perception of Pests Problem in Beekeeping Business at Different Ecological Zones in South Western Nigeria

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Abstract: This survey appraised the beekeepers knowledge and perception of pests problem in beekeeping business at different ecological zones in south western Nigeria. Structured questionnaires were administered among 300 beekeepers comprising of 50 each from the six states at three different ecological zones of the southwestern Nigeria. The results showed the socioeconomic characteristics of the beekeepers. 65% of them are within the age group of 21 - 40 years old, 51.67% are married and 66.7% were male, 60% Christians and 49.7% with tertiary education. 94% claimed that the presence of pests had effect on the bee colonies and 85.3% claimed that the presence of pests affect both the quantity and quality of honey produced. 92.7% claimed that beekeeping business is a profitable venture. There is a significant difference among the number of beehives in mangrove forest, Lowland Rainforest and Savannah, while no significant difference between the number of bee farms in low land rainforest and savannah. Number of hives in mangrove forest is significantly different from the numbers in low land rainforest and savannah. No significant difference was found in the number of bee colonies in the three ecological zones.

Key words: Appraising · Beekeepers · Pests · Problems · Beekeeping Business · Southwestern Nigeria

INTRODUCTION

The honeybee *Apis mellifera* L. (Hymenoptera: Apidae) is one of the most well known and economically beneficial insects [1]. In the tropics, beekeeping is potentially a good source of income. The main product is honey; but beeswax, beemilk (royal jelly), pollen, propolis and bee venom is also harvested. Besides this direct economic benefits derived from hive-products, bees pollinate many plants, thus contributing immensely to agricultural production and the conservation of biological diversity [2]. In addition, honey, wax, venom, propolis and royal jelly are marketable products. The honey yield depends largely on the climate, vegetation, bee race and the skill of the beekeepers. The greatest value of beekeeping lies in the fact that bees pollinate agricultural and horticultural plants. When a honeybee finds a new flower, she encourages her hive mates to use the sources. The bees will visit the flowers as long as food (Pollen and nectar) is available. This flowers pollination make bee's exceptional valuable to plants which need to be cross-pollinated. If there are enough bee colonies in the area at

the flowering time the plants will give higher yields and the quality of the fruits will be improved [3]. The benefits of honeybee pollination are usually either increased yield and fruit size, for example, in strawberries, or an increase in the earliness and uniformity of seed set in crops such as oilseed rape [4, 5]. The demand for bee hive products, especially honey is increasing in Nigeria due to the awareness on the adoption of modern beekeeping and importance of medicinal, cosmetic and other uses of honey and other beehive products. Lawal and Banjo [6] gave a checklist of the pests, parasites and diseases that are associated with (*Apis mellifera adansonii*) honeybees in southwestern Nigeria. Moreover, modern beekeeping is gradually becoming popular in Nigeria with the use of modern equipments [7]. However, there is a need to appraise the beekeepers knowledge and perception of pests' problem in beekeeping business at different ecological zones and to evaluate, the socio-economic and technical characteristics of beekeepers in terms of pests associated with honeybee or bee hives in their individual farms in southwestern Nigeria.

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Fig. 1: Locations of the study area in south-western Nigeria

METHODS AND MATERIALS

The Study Area: This study was carried out in twenty different locations within the six southwestern states that lies within three main ecological zones located within latitude $6^{\circ}34'N-8^{\circ}44'N$, longitude $3^{\circ}18' E - 4^{\circ}50' E$ and Elevation 39.4 - 330.0m in Nigeria (Fig. 1). Structured questionnaires were administered among 300 beekeepers at average of 50 in each state of southwestern Nigeria. The services of interpreter or guides were employed where needed during the field work.

Statistical Analysis: The data collected were analyzed with the statistical package SPSS software for

Descriptive statistics, Frequency counts distribution, percentages and Chi square test at $P=0.05$.

RESULTS

Socioeconomic Data on the Bee Farmers: Table 1 shows the socioeconomic characteristics of the beekeepers interviewed. 65% of them are within the age group of 21 - 40 years old, while 7.3 and 1.67% were within the age of 1 - 20 and 61 and above, respectively. This indicates that the people that were involved into beekeeping are mainly between 21 - 40 years old. 51.67% are married, 66.7% were male, 60% Christians and 49.7% with tertiary education. All the beekeepers interviewed had experience the presence of different pests.

Beekeepers experience and encounter with honeybee pests

Data showed that 86.7% of the beekeepers have a beefarm (Table 2). 98.7% get their colonies naturally through baiting and the major ways of selling the honey produced is largely (54.6%) through local market, some (25.7%) through friends and relations and 16% through cooperative, only 3.68% by export. All the beekeepers interviewed had experience the presence of different pests in their beefarms and no one (0%) had experienced the presence of parasites and diseases.

Also, 94% claimed that the presence of pests had effect on the bee colonies and 85.3% claimed that the presence of pests affect the quantity of honey produced 88.3% had strong colonies, 36% have weak colonies and 92.7% claimed that beekeeping business is a profitable venture.

Number of bee farms, number of hives, number of colonies and number of hives harvested.

The mean value of number of bee farms, beehives, colonies and hive harvested per year in all the ecological zones (Table 3).

The average number of beefarms owned by the beekeeper interviewed in the low land rainforest 62, savannah 63 and mangrove forest 50. The numbers of bee hives in the low land rainforest, savannah and mangrove forest are 1072, 1650 and 1615, respectively. The average numbers of bee colonies in low land rainforest, savannah and mangrove forest are 957, 1090 and 1095, respectively.

Table 1: The Socioeconomic characteristics of the interviewed beekeepers

Characteristics	States in Southwestern Nigeria						Frequency	%
	Ekiti	Lagos	Ogun	Ondo	Osun	Oyo		
Age								
1 - 20	5	5	-	-	5	7	22	7.30
21 - 40	35	40	35	25	35	25	195	65.0
41 - 60	10	5	15	20	10	18	78	26.0
61 and above	-	-	-	5	-	-	5	1.67
Marital Status								
Single	10	-	15	-	5	5	35	11.67
Married	20	35	20	20	25	35	155	51.67
Divorced	15	10	15	25	15	10	90	30.0
widow	5	5	-	5	5	-	20	6.67
Sex								
Male	40	35	40	30	30	20	200	66.7
female	10	10	10	20	20	30	100	33.3
Religion								
Christian	35	30	20	30	40	25	180	60
Muslim	10	20	30	15	10	25	110	36.7
Traditional	5	-	-	5	-	-	10	33.3
Educational								
Primary	5	8	18	5	5	10	51	17.0
Secondary	29	10	7	19	15	20	100	33.3
Tertiary	16	32	25	26	30	20	149	49.7

Table 2: Beekeeping experience by farmers and their encounter with pests

Characteristics	States in Southwestern Nigeria						frequency	%
	Ekiti	Lagos	Ogun	Ondo	Osun	Oyo		
Do you have bee farm								
Yes	44	40	41	40	50	45	260	86.7
No	6	10	9	10	-	5	40	13.3
How did you get the colony								
On nature (baiting)	50	49	50	50	50	47	296	98.7
Buying of colony	-	1	-	-	-	3	4	1.3
Method of selling by beekeepers								
Hawking	-	-	-	-	-	-	-	-
Local market	25	25	30	29	25	30	164	54.6
Export	-	5	1	-	-	5	11	3.68
Cooperative	5	10	2	16	15	-	48	16.0
Friends and relative	20	10	17	5	10	15	77	25.7
Stores	-	-	-	-	-	-	-	-
Encounter with any Pests in Your bee farms.								
Yes	50	50	50	50	50	50	300	100
No	-	-	-	-	-	-	0	-
Parasite								
Yes	-	-	-	-	-	-	0	-
No	50	50	50	50	50	50	300	100
Diseases								
Yes	-	-	-	-	-	-	0	-
No	50	50	50	50	50	50	300	100
Do pest have any effect on your colony								
Yes	40	50	50	45	47	50	282	94
No	10	-	-	5	3	-	18	6

Table 2: Continued

Does presence of pests affect the quantity of honey produced								
Yes	45	45	35	50	46	35	256	85.3
No	5	5	15	-	4	15	44	14.7
Do you have any strong colony								
Yes	40	50	45	45	40	45	265	88.3
No	10	-	5	5	10	5	35	11.7
Do you have any weak colony								
Yes	20	15	20	15	18	20	108	36
No	30	35	30	35	32	30	192	64
Is beekeeping business profitable								
Yes	45	48	46	45	50	44	278	92.7
No	5	2	4	5	0	6	22	7.3

Table 3: Mean value of number of bee farms, colony and hive harvested per year in all the 3 Ecological zones in southwestern Nigeria

Parameters	Respondents within the Ecological zones		
	Low land Rain forest	Savannah	Mangrove forest
Number of bee farms	62	63	63
Number of hive in bee farms	1072	1650	1615
Number of bee colonies	957	1090	1095
Number of hives harvested / year	555	568	620

Table 4: Quantity of honey produced by strong and weak colony in the ecological zones (litres / hive)

Parameters	Respondents within the ecological zones		
	Low land Rain forest	Savannah	Mangrove forest
Quantity of honey produced by strong colonies	25.3	25	24
Quantity of honey produced by weak colonies	7.0	7	7

Table 5: Quantity of honey produced by strong and weak colony attacked by pests in each ecological zone

Parameters	Responses within the ecological zones		
	Low land Rain forest	Savannah	Mangrove forest
Quantity of honey produced by strong colonies attacked by pests	19	20	18
Quantity of honey produced by weak colonies attacked by pests	3.67	3.5	3

Table 6: Means performance of number of bee farms. Number of bee hives and number if colonies in the ecological zones of study areas

Ecological zones	N	Number of bee farms	N	Number of honeybee hives	N	Number of colonies
Mangrove forest	50	1.0000 ^a	50	20.6000 ^e	50	19.9667 ^a
Low land rainforest	150	1.2333 ^b	150	32.3000 ^d	150	21.8000 ^a
Savannah	100	1.2500 ^b	100	33.0000 ^d	100	21.9000 ^a

N= number of Responses

Moreover, the average number of hive harvested per year in each ecological zone are as follows 555 (Low land rainforest), 568 (Savannah) and 620 (Mangrove forest).

Estimated quantity of honey produced by beekeepers

The estimated quantity of honey produced in litre/hive by strong and weak colonies in the ecological zones is shown in Table 4.

In lowland rainforest, savannah and mangrove forest the quantity of honey produced by strong colonies are

25.3, 25 and 24 litre/hive, respectively, while in a weak colony in low land rainforest, savannah and mangrove forest is average of 7 litres per hive.

Estimated quantity of honey produced when the hive is infested by pests.

Table 5 shows the quantity of honey produced by strong and weak colonies after the attack by pests in the ecological zones.

The average quantity of honey produced by strong colonies attacked by pests are 19, 19.5 and 18 in low land

rainforest, savannah and mangrove forest, respectively, while in weak colonies attacked by pest/visitors are 3.67, 3.5 and 3.0 in lowland rainforest, savannah and mangrove forest, respectively.

Performance of bee farms, beehives and colonies in each ecological zone

Table 6 shows that there is significant difference between the number of beehives in mangrove forest, Lowland Rainforest and Savannah, while no significant difference between the number of bee farms in lowland rainforest and savannah. Number of hives in mangrove forest is significantly different from the numbers in lowland rainforest and savannah. No significant difference in the number of bee colonies in the three ecological zones.

Values in a given column with different letters are significantly different ($P < 0.05$)

Precautions taken against the pests infestation into the honeybee hives by the beekeepers interviewed.

According to all the respondents, used engine oil is poured at the base of the bee hives stand; the grease is rubbed on the stand to prevent ants and other crawling organisms to enter into the bee hives. General clean up of the surroundings and the bee hives is carried out to prevent infestation. The only control method that is being applied by all the beekeepers is the burning of the heavily infested bee hives box.

Profitability of beekeeping businesses by the beekeepers

Despite of some constraints such as infestation of pests, marketing problems, low level of practices of modern beekeeping technology, lack of good techniques for various manipulations, lack of funds, manpower and support, honey production from beekeeping was found profitable enterprise for beekeepers in this study area.

DISCUSSION

This study has revealed that apiculture has passed the hobbyist stage and is fast becoming a serious, though yet small-scale, business. At present the major focus is honey production, with other products secondary. This is a new vision indicated by the aspirant age distribution (21-40yrs) of the current bee farmers. This may become an advantage since they have many expected years to active bee farming. The practice of modern beekeeping technology in the production of honey and other bee hive products is still very low in southwestern

Nigeria. This observation agrees with the report of Oduntan [7] who stated that modern beekeeping is gradually becoming popular in Nigeria with the use of modern equipment. The accelerative recruitment of bee farmers is probably related to the ubiquitous distribution of bees and their anthropocentric activities. Delaplane [1] reported that bees exist everywhere on the continent whereas man lives from the equatorial evergreen rain forest to the desert oasis.

The findings revealed that bee farmers still depend on nature to get their bee colonies through baiting of hives. In contrast to what obtains in the developed countries such as the United States of America, where bees are bought as small nucleus or as nucleus and queen, which expands to a full size honeybee colony [8]. Whereas the current Nigeria baiting methods may seem cheap, which is an indication that modern technology in beekeeping is still very low; moreover, it does not guarantee successful inoculation. But, with the inoculum approach the hive starts out fast.

The current level of production of honeybee products is very low and does not satisfy local demand. The little honey produced is largely sold through local markets and just about 3% are sold as export. This is similar to a previous report [6] in Uganda where 100 metric tonnes of honey was sold to the local market while export to foreign market was only a maximum of 3 metric tonnes.

That the number of beehives was highest in Savannah, followed by Mangrove Forest and Lowland Rain Forest, suggests that the thriving of bee colonies there may have encouraged farmers to establish more. In contrast, the number of bee colonies was highest in Mangrove forest, followed by Savannah and Lowland rain forest. The average numbers of hives harvested per year in Lowland rain forest, Savannah and Mangrove are 555, 568 and 620, respectively.

The economic loss due to the pests is indicated by honey production in strong and weak colonies. While, a strong but uninfested colony produced 25 L per hive per year, a strong but infested colony only produced 19 L, a 24% drop. It is even worse for a weak colony where an uninfested colony produces 7 L but an infested colony produces 3.5 L (a 50%) drop. This demonstrates that infestation decreases the performance of the colonies. The precautions that farmers take against pest infestation by pouring engine oil in container at the base, rubbing grease on the hives stand and cleaning up of the surroundings of the bee

hives, all these must have been effective in preventing infestation of pests. This is in line with the recommendation of Jones [10] that every effort must be made to prevent ants from using the hive legs as ladder to climb up to the hive. He further recommended that various methods must be employed such as standing the legs in cups of old motor oil, putting bands of grease around the legs and spreading of ashes around the stand to discourage the growth of grass.

In conclusion, the current level of production of honeybee products is very low and does not satisfy local demand. The economic loss due to the pests is indicated by honey production in both strong and weak colonies. The current Nigeria baiting methods (Natural) may seem cheap, which is an indication that modern technology in beekeeping is still very low. It is therefore recommended that more awareness should be put in place on the modern technology in beekeeping with effective preventive and control measures to the various pests of honeybees, which will enhance more production of honeybee products to meet all human daily need in Nigeria. Also a good networking system that will reach out to a lot of beekeepers on good hive management and encourage many people from keeping bees.

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