Agriculture, Forestry and Fisheries
2015; 4(3-1): 73-80
Published online May 14, 2015 (http://www.sciencepublishinggroup.com/j/aff)
doi: 10.11648/j.aff.s.2015040301.23
ISSN: 2328-563X (Print); ISSN:2328-5648 (Online)

Bee-Keeping for Wealth Creation Among Rural Community Dwellers in Imo State, South-Eastern, Nigeria

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To cite this article:
Nwaihu E. C., Egbuche C. T., Onuoha G. N., Ibe A. E., Umeojiakor A. O., Chukwu, A.O.. Bee-Keeping for Wealth Creation Among Rural Community Dwellers in Imo State, South-Eastern, Nigeria. *Agriculture, Forestry and Fisheries*. Special Issue: Environment and Applied Science Management in a Changing Global Climate. Vol. 4, No. 3-1, 2015, pp. 73-80. doi: 10.11648/j.aff.s.2015040301.23

Abstract: This study was carried out in Imo State, South Eastern Agro-Ecological Zone of Nigeria. Five Local Government Areas and five communities were selected for the study. From the five communities, eight (8) Bee-Keepers were selected on purposive basis based on list of bee-keepers collected from Imo ADP field staff. This gave a total of 40 respondents for the study. Data for the study was collected using questionnaire, and oral interview schedule. Both primary and secondary data were used in addition to internet services. The information elicited from the respondents were based on the objectives of the study such as socio-economic characteristics, cost and return on beekeeping, constraints militating against beekeeping and the prospects of the enterprise. The data generated were analyzed using descriptive statistics such as percentages, frequency distribution tables, mean, Gross Margin and Net Farm Income. The result showed that the mean age of the respondents was 37 years, male respondents accounted for 72.5%, 40% had tertiary education, and family labor was the major source of labor. Personal savings (equity fund) was the major source of finance (85%), 55% had information from ADP Extension Agents, 80% use Kenyan Topbar, major Bee products processed were honey (60%) and Bee wax (40). It is profitable in the area as initial cost outlay was N15,900 and returns (Total revenue) is N42,000, thus getting N39,300 as gross marginal income with N26,100 as Net Farm Income (NFI). Lack of finance was the major constraint militating against the enterprise (39.6%) followed by Non-colonization of hives (l8.7%). However, worthwhile recommendation on making fund available to Beekeepers by Commercial Banks, engaging the services of extension staff and use of appropriate attractants like sugar solution and sweet fresh palm wine were proffered as solution to some of the teething constraints. However, the enterprise of beekeeping has bright future prospects in the area, considering the number (40) already in practice. Therefore, beekeeping can create wealth in the area and beyond.

Keywords: Bee-Keeping, Wealth Creation, Rural Community Dwellers, Imo State Nigeria

1. Introduction

The Science of Bee-keeping is known as Apiculture. This technology has hive construction, honey harvesting and processing, wax extraction, disease and pest control as well as setting up the Hives (site selection). There are messages on absconding and control [1]. This Agro Forestry System can be integrated into many farming systems. It is best practiced where fallow system is still practiced. The use of non-timber forest products (NTFPs) is as old as human existence [2]. In subsistence economies, the roles and contribution of NTFPs are crucial because of their richness of varieties as source of food, fodder, fibre, fertilizers, herbal medicine and craft activities. Bees are traditionally an important part of small-scale integrated farming systems. Bees do well in natural forests and on integrated farms with abundant water and flowers [3]. There are altogether 20,000 species of honey bees, most of which are found in Asia. Only one of these species occurs in other parts of the world, either naturally or imported by man. Two species are domesticated and used in beekeeping. *Apis cerena* in South East Asia and *Apis mellifera* worldwide [4], [5]. Bees are vital contributors to pollination and crop production. Bee keeping as NTFPs resources provides raw materials to support processing enterprises which include internationally important

commodities used in food products and beverages, construction materials, cosmetics and cultural products. They support village level confectionary, flowering, perfumes, medicines, paints, polishes Bees produce honey which contains about 80% of sugars that are readily absorbed by the body and it is extremely suitable food for children, sick people and those who perform heavy mammal Labor [6]. Honey as produced by bees is extensively used in pharmaceutical and beverage industries as pleasant-testing food component, sweetener for food and drinks, effective in the treatment of superficial wounds, treatment of sore or throat complaints. In many countries of the world, honey is used to make beer or wine [7].

It has high economic value, hence a good trade commodity. Both local and international markets are readily available. It requires a minimal amount of labor and no external inputs such as fertilizers or pesticides. Bee Keeping encourages minimum tillage in the acre (0.4ha) around the hive, since noisy equipment may disturb the bees [8]. Honey can also be used as a symbol of social prestige and is used to pay bridal dowries. In some cultures, an exchange of honey symbolizes the settling of major conflicts. Honey is used as a food preservative [9]. Bee wax is used in the manufacture of cosmetics, candles, foundation sheets for hives, polishes and cosmetics. Generally, it is used in shoes and cosmetics industries [10]. Bees use pollen to feed their larvae. The pollen can be collected using a simple trap placed at the flight entrance of the hive. Pollen contains 35% protein and can be eaten dry or added to other foods, as a good source of protein. Pollen is sold to the perfume industry, eaten or for medicinal purposes. Pollen is hygroscopic and must be protected against moisture, and it deteriorates quickly when attacked by fungi. Bee propolis is a resin that bees collect from the plant and they use it to cover the inside of the hive. Propolis has some therapeutic and antibiotic characteristics used for embalmment in early Egypt [11].

1.1. Problem Statement

In spite of the importance of NTFPs, their contributions to rural livelihood in many developing countries are yet to be acknowledged [12]. Timber was perceived as the dominant reason for forest management and hence no attention was paid to NTFPs by foresters, policy manners and economic planners. In Nigeria particularly, there is no clear-cut policy directed at NTFPs at Federal, State and Local Government or even communal levels. NTFPs has long been considered minor or secondary forest products. There was therefore general lack of appreciation of the value and roles of NTFPs in the livelihood of rural dwellers [13]. Modern bee-keeping technology, though not quite popular among the rural community dwellers can be used as a poverty reduction mechanism in Nigeria. The specie of bee, *Apis mellifera* commonly known as the honey bee is the most widely-spread and abundant insect on earth [14]. Due to ignorance of the profitability bee-keeping and fear of being stung by bees deter people from venturing into bee-keeping. Bee keeping for wealth creation has practically remained untapped in the country. Those already involved in beekeeping in the rural communities are not utilizing all the bee products but are mostly interested only in honey and bee wax extraction.

Another set of problem for bee keeping is the incidence of pest attack, bush burning, indiscriminate pesticide use, and abscondment of bees, non colonization and inadequate information on the enterprise reduces the productivity of beekeeping [15] and [16]. Local beekeepers do not keep records of their activities making it difficult to determine the level of progress they make. Bees may sting the careless if they become aggressive on being disturbed by children.

1.2. Objectives

The objectives of the study are to;

1. Determine the socio-economic characteristics of the respondents.
2. Determine the cost and returns of beekeeping.
3. Determine the constraints of beekeeping.
4. Assess the prospects of beekeeping in the study area.

1.3. Justification

This study will create awareness on the profitability of beekeeping and encourage non-beekeepers to venture into it as means of wealth creation. Bee-keeping does not require a large piece of land or compete with crops or livestock for land space. Bee products provide farmers with an additional source of income as both local and international markets are readily available. Beekeeping can be used as a means of poverty alleviation, hunger reduction and job creation especially in the rural areas of the country where there is a high level of unemployment and the people are mostly engaged in subsistence agriculture for food production [17], [18]. Beekeeping can be undertaken by anyone who has the ability and determination to look after bees properly enough and courage to work with bees. Working with bees requires a gentle touch and calm disposition. It also requires basic understanding of the honey bees behavior during the various seasons and during handling and moving [19]. Depending on the country and environmental factors, a typical colony of bees can produce 80-120 pounds of surplus honey and 10 pounds of pollen in a year [20], [21] and [22]. Honey can be eaten or used in any type of cooking or to sweeten beverage. It can be used to make jams and marmalades [23]. It can be used as medicine alone and sometimes in combination with herbs for common colds, cough, gastric ulcer, restlessness, hypertension, infected surgical wounds, burns and sores, eye itching and taken as tranquilizer [24]. The bee wax is used as a water proof agent for wood and leather,, production of candles, ointments, soaps, polishes, battery cells, transformers, clothes (Attire) and used by dentists as an artificial denture, and used by shoe makers for strengthening shoemakers threads. The venom can be used to cure disease such as arthritis and for treatment of nervous system disorder [25].

The waxy substance, propolis contains enzymes which are believed to contain immunity factors which are used

internally. They stimulate the body and give it a natural resistance to diseases. The bee venom has useful medicinal properties and can be collected by placing a clean polyether sheet at the entrance of the hive. The queen and the worker bee produce the venom [26]. The propolis otherwise known as bee gIue differs in composition according to the plant from which the bees have been collecting. The bees bring the glues on their hind legs to the hive. They mix it with their own wax and saliva to produce propolis [27]. The propolis is used to prepare cough syrups, toothpastes, lotions, skin soaps, skin oils. Health care products and medical ointments containing propolis are used for wounds, scares, infections, muscle ailments, eczema, warts nail cuticle [28].

The enterprise needs relatively small investment capital and most of the equipment needed for both traditional and modern beekeeping can be sourced locally. *Apis mellifera*, commonly known as honey bee, is most widespread and abundant insects on earth [29]. It is used throughout history for the production of honey and for pollination of crops. *Apis mellifera* has proved to be an extremely useful species. It is estimated that the total value for worldwide crop pollination is 153 billion Euros [30]. Bees are social. Insects that live in colonies and are divided into three groups namely the queen, the drones and the worker bees. Honey has been harvested from, the wild nest for several years until it was discovered that honey crops can be obtained in more convenient and easier way if bees are encouraged to nest in hives. This led to the origin of bee keeping and management of bees in hives. It is widely practiced in Nigeria and other countries of the world as a result of magnificent importance of honey in the area of food and medicine [31]. Modern technologies of bees and keeping them were introduced into Nigeria in the early 1990's [32] [33]. [34] described the enterprise as means of empowering youth economically because of its many advantages over other types of agriculture enterprise. Men, women, youths and the elderly can participate in beekeeping within the homestead. Beekeeping can be practiced where fallow system is still practiced. The newness of the technology and demand from farmers as well as the potentials of this technology in poverty reduction makes it to be pursued with vigor and ease [35]. Honey is formed during alternate swallowing and regurgitation of nectar and pollen repeatedly, by which sucrose in the nectar and pollen are hydrolyzed to glucose and fructose by special gland in the bee. Honey is a complete food of its own and contains every vitamin and minerals needed by the body.

2. Materials and Methods

Bees normally collect nectar from various plants around its hive to produce honey. The process helps cross pollination of flowers, which is crucial for flowering plants. After flying long distances, bees find open flowers which they buzz to, hungry to drink the nectar; they gather the flowers sugary sap in their glands [36]. The bees suck in the juice with their long proboscis and pass it to their honey stomach where it is processed with saliva, transforming it from a complex sucrose into simple fructose that is easy to digest [37]. Though honey contains sugar, it is not the same as white sugar or artificial sweetener. Its exact combination of fructose and glucose regulate blood sugar and it is readily assimilated and more acceptable to the stomach. This takes care of constipation, diabetes [38]. Honey is used for cooking, baking, and as sweetener in commercial beverage production, cosmetics industries for the production of body cream and soaps. This is due to the anti bacteria property of honey and when combined with other ingredients can be moisturizing and nourishing to the skin. In cases of barrenness, or infertility, the royal jelly contained in honey has been of immense solution. Royal jelly is used in the production of skin ointment, fertility drugs, etc and it is also believed to be the reason for the prolonged life of the queen bees [39]. Bee sting confers body immunity to malaria attack on the victim. According to [40], single sting is reported to be medicinal but multiple stings can be dangerous as many alarm pheromones might have been injected into the body.

Imo State is situated in Southeastern geographical zone of Nigeria. It lies between latitudes 5°10'N and longitudes 6°35'E and 7°28'E covering an area of 5,289.4 square kilometers. It has a population of 4.7 million people. The population density is over 500 persons per square kilometer [41]. It is bounded on the east by Abia State, on the South and South West by Rivers State, on the Southwest by Niger across which lies Delta State and on the North by Anambra and Enugu States. The area falls within the tropical rainforest zone characterized by high intensity of rainfall in most parts of the state which measures up to 2,550 millimeters. It has two distinct seasons; the rainy and the dry seasons with intervening cold dry spell called "August break". The rainy season extends from April to October and precipitation reaches its maximum towards the end of the season when there is an almost immediate change to dry month conditions. The mean temperature is 270°C while relative humidity ranges from 60-90 percent [42]. Five distinctive soils types have been identified in the area and include Lithosols, alluvial, ferralithic, medium fine altisol and clayey hydromorphic soils while the natural vegetation is the tropical rainforest.

The State has three agricultural zones namely: Okigwe, Orlu and Owerri and twenty seven Local Government Areas. The inhabitants of Imo State are predominantly farmers which are mainly on subsistent level under rain fed agriculture. The rainy season stretches from mid March to mid October and the dry season extends from late October to early March. However, there is no clear cut demarcation between the rainy season and dry season these years due to climatic change which has made the farmers to be unpredictive of the seasons. Though, the rainy periods are often more than the dry periods within the year. The area is covered with woodlots or open trees/shrub vegetation interspersed with short grasses. Agriculture is the major source of income of the rural populace producing mainly staple food crops such as yams, cassava, maize, cocoyam, vegetables, rice, bananas, pineapples, plantain, etc. Livestock

rearing, fish farming, agro-forestry farming complement these food crops, cash and fruit tree crops [43].

The rural household economy revolves around two major sectors: Small holder farmers and nonagricultural sectors. Family labor is the major source of labor while land is acquired by inheritance and leasehold. The tropical disposition of the place favors beekeeping as there is abundant supply of nectar from flowering plants for bees' consumption (foraging) and production of honey and other bee products. Purposive sampling technique was used to select five Local Government Areas (LGAs) based on information gathered from Imo State Agricultural Development Programme, an apex agricultural institution in the state. From the five LGAs, five communities were selected and later, eight (8) beekeepers were selected from each of the selected communities to get a sample size of forty (40) beekeepers. The data used for the study was collected from both primary and secondary sources plus oral interview schedule for clarity of purpose. Questionnaires were administered to the forty (40) respondents. The information (data) elicited were on cost and return of beekeeping and the constraints militating against beekeeping in the study area. The secondary data were from relevant journals, textbooks, the internet, ADP and other relevant sources. The generated data were analyzed using Descriptive Statistics such as percentage, frequency counts, tables, mean, net farm income and Gross Margin analysis. The model specification is stated thus:

$$\text{Percentage} = \frac{x}{N} + \frac{100}{1}$$

Where
x = values of respondents
f = frequency of the respondents
n = total number of the respondents
x = the mean value of x
The Gross Margin Analysis
GM = TR-TVC
Profit = GM — TFC
Where TR = Total Revenue
TVC Total Variable Cost
TFC = Total Fixed Cost

3. Results and Discussion

3.1. Socio-Economic Characteristics of Respondents

Table 1 show that 72.5% of the respondents were male while 27.5% were female. This implies that both sexes participated in bee-keeping in the study area. The wide gap in the level of participation could be attributed to the fact that men are more courageous in keeping or working with bees. This is in keeping with the assertion of [44] that beekeeping can be undertaken by anyone who has the determination to look after the bee properly and courageously. The same table shows that the respondents fall within the age of 26-35 years which accounted for 35%, 2.5% were within 16-25 years, 22.5% fell into 36-45 years, 32.5% were within 46-55years while 7.5% fell within 56 and above. The mean age of the respondents in the study area was 37 years old. Equally, in the same table, 72.5% of the respondents were married, 12.5% were single, 5% widows while 10% were widowers. This indicates that marital status has no strong influence and limitation for one to run beekeeping enterprise.

Table 1. *Distribution of Respondents According to Socio-economic characteristics*

	Frequency	**Percentage (%)**
Socio-Economic Characteristics Gender		
Male	29	72.5
Female	11	27.5
Total	40	100
Total	60	100.0
Age		
15 below	-	-
16-25	1	1
26-35	14	35.0
36-45	9	22.5
46-55	13	32.5
56 and below	3	7.5
Total	60	100.0
Mean = 37		
Marital Status		
Married single	29	72.5
Widowed	5	12.5
Widower	2	5.0
Divorced/separated	4	10.0
Total	40	100.0
Household		
1-2	6	15.0
3-4	3	7.5
5-6	9	22.5
7-8	22	55.0
9-10	-	-
Total	40	100.0
Mean = 5		
BEEKEEPING Experience (Years)		
1-2	2	5.0
3-4	5	12.5
5-6	15	37.5
7-8	18	45.0
9-10	-	-
Total	40	100.0
Mean = 3		
Education		
Tertiary	16	40
Secondary	12	30
Primary	7	17.5
No formal education	5	12.5
Total	40	100.0
Source of Labor		
Family	31	77.5
Hired/Exchange	3	7.5
Both	6	15
Total	40	100.0

Married life is an added responsibility and as such, the desire to engage in beekeeping may be to beef up sources of income for the household. Table 1 shows that 55% of the respondents had household size of 7- 8, 22.5% had 5-6, 15% had 1-2 while 7.5% had 3-4. Those with reasonable household size were sure of regular labor supply as family labor is the major source of labor in the study area. It is also interesting to know that 45% of the respondents had 7-8 years experience, 37.5% had 5-6 years, and 12.5% had 3-4 years while 5° h had 1-2 years beekeeping experience. This implies that the business is on course and is such a bright prospect for the industry/venture in the study area. It is equally worthy to point out that majority of the respondents attained tertiary level of education. This represents 40%, 30% has secondary education, 17.5% had primary education while 12.5% had no formal education. Finally, the table shows that 77.5% of the respondents depended on family labor as source of farm hand, 15% made use of both hired and family labor while 7.5% relied on hired labor.

Table 2. *Distribution of Respondents According to Source of Finance for their Apiary*

	Frequency	Percentage %
Source of Finance		
Personal fund (equity fund)	34	85
Relations/Well-wishers	4	10
Thrift Associations (Eludiegwu)	2	5
Banks	-	-
Total	40	100.0
Source of FINANCE		
Extension agents from ADP	22	55
Fellow beekeepers	8	20
Radio Farmer	6	15
Workshop	4	10
Bulleting/posters	-	-
Total	40	100.0
Types of Hives in Use		
Kenyan Topbar Hive	32	80
Langstroth Hive	4	10
Both Local and Modern Hives	4	10
Only local Hive	-	-
Total	40	100.0
Number of FINANCE		
1-2	1	2.5
3-4	6	15
5-6	18	45
7-8	15	37.5
9-10	-	-
11 and above	-	-
Total	40	100.0
Bee products		
Honey	24	60
Bee-wax	-	-
Pollen	-	-
Propolis	-	-
royal Jelly	-	-
Been Venom	-	-
Honey and Bee-wax	16	40
Total	40	100.0

Source: Field Survey Data 2014.

Table 2 shows that 85% of the respondents sourced their takeoff fund from personal savings (equity fund) and sometimes got financial assistance from relations/well-wishers at interest free which represents l0% of the respondents. 5% of them borrowed from thrift associations that operate at community level. The same table indicates that 55% of the respondents got their information on beekeeping from IMO ADP extension agents resident in their communities and local government, 20% got information from fellow beekeepers that started the business of beekeeping as early adopters. Others (15% and 10% respectively) got information through radio farmer and workshop attendance whenever organized. From the foregoing, 80% of the respondents made use of the Kenyan top bar, ‘0% made use of Langstroth, while 10% combined both local (drums, raffia palm log and clay pot) modern hives. In the same table, 45% of the respondents had 5-6 hives, 37.5% had 7-8 hives while 15% had 3-4 and 2.5% had 1-2 hives. This indicates that the respondents if given the right support will move the business of beekeeping into a professional venture rather than a hobby. Furthermore, 60% of the respondents were interested only in honey production while 40% were interested in both honey and bee wax production.

3.2. Evaluation of the Cost and Return from Beekeeping in the Study Area

From the result below, it can be observed that beekeepers in the study area are ‘breaking even’ from their investment into beekeeping business. The initial investment can be recouped from first harvest and at the same time were able to make substantial profit to cope with. This implies that beekeeping in the study area is a profitable business that one can venture into as a means of generating income. From the gross margin analysis, the result indicates that the major cost of beekeeping business comes from the fixed cost items such as bee hive, smoker, protective cloth, centrifuge, etc. This being the case, it can be predicted correctly that in the next harvest, the beekeepers are going to record more profit due to the fact that once the enterprise has been set up, little or no expenses are required to maintain the enterprise as the bees can fend for themselves without the intervention or involvement of the beekeeper. This result also shows that if one should start up with more than one hive, the person will make more profit as the quantity of products that will be gotten will increase, consequently• occasioning an increase in revenue. Another advantage of starting with more than one hive is that the only additional fixed cost required will be the purchase of the additional hives and the hive stands. In this case, other Fixed Cost (FC) will remain constant while there will be only a little increase in the Total Variable Cost (TVC). The harvest of other bee products will also increase the revenue gotten. The economic implications of this are that beekeeping industry is very lucrative, rewarding, good payback, and suitable means of wealth creation, especially in the rural areas. Beekeeping as a component technology in agriculture is not buying and selling, it is serious business [45].

Table 3. *Average Gross Margin and Net Farm Income Analysis for one Hive Harvest in a Season*

Items	Average Cost ₦
Variable Items	
Attractants	600
Transport	300
Packaging Materials (Bottles)	1,500
Label	300
Total Variable Cost (TVC)	2,700
Fixed Cost Items	
Bee Hive	5,000
Hive Stand	2,000
Protective Cloth	1,000
Rubber Hand Gloves	500
Boots and Scrapper	1,000
Smoker and Press	1,000
Knife (Extruder)	1,000
Sieve and Filter (Centrifuge)	800
Hat and Veil	400
Pin and Thread	100
Bucket (Plastic Bucket)	400
Total Fixed Cost (TFC)	13,200
Total Cost (TC)	15,900
Products from Hive	
Honey	36,000
Bee Wax	6,000
Total Revenue	42,000

Source: Field Survey Data, 2014.

Gross Margin and Net Farm Income

GM = TR - TVC

= ₦42,000 - ₦2,700

= ₦39,300

Net Farm Income (NFI) = GM - FTC

= ₦39,300 - N13,200

= 26,100

3.3. Constraints Militating Against Beekeeping

Table 4 indicates that there were identified constraints militating against the smooth activities of beekeeping in the study area. Beekeeping though less capital intensive, lack of finance is the most outstanding challenge against large scale beekeeping among the beekeepers. This represents 39.6% of the respondents. 3.3% accounted for pests and predator attack, 18.7% had problem of non-colonization of their hives, 8.8% had problem of theft and bush burning, 14.3% had problem of inadequate technical skill and information and 2.2% had problem of indiscriminate pesticide use. Furthermore, 13.2% of the respondents had problem of abscondment of bees.

Table 4. *Distribution of Respondents According to Constraints Faced*

Constraints	Frequency	Percentage
Lack of Finance	36	39.6
Pest and Predator Attack	3	3.3
Non-Colonization	17	18.7
Stealing and Bush Burning	8	8.8
Inadequate Technical Skill and Information	13	14.3
Indiscriminate Pesticide bee	2	2.2
Abscondment of bees	12	13.2
Total	91	100.0

Source: Field Survey Data, 2014

Multiple responses were recorded hence total frequency exceeds the sample size.

3.4. Prospects of Beekeeping in the Study Area

Considering the number of people already in the business, the low financial requirement/investment and low labor need, the business has a promising bright future for those already in the business and intending people who want to join. Nevertheless, the beekeepers expressed that they had problems like lack of fund, incidence of pests and predators, bee abscondment, non-colonization of hives, theft and bush burning, inadequate technical skill, inadequate information and indiscriminate pesticide use.

The study also showed that the beekeepers were more interested in honey and bee wax products probably due to low level of technical skills acquire. Above all the result showed that beekeeping has a bright future. Given the limited attention the business needs, it can be carried out on part-time basis even by Civil Servants in the non-agricultural sector. The use of more hives and extraction and processing of the bee products like propolis, pollen, bee venom, royal jelly apart from honey and bee wax will increase the profit margin and net farm income of the enterprise. There should be traces around areas where hives are sited, controlled application of pesticides be adopted, extension services should be extended to beekeepers to teach them how to handle other bee products other than honey and bee wax. Hives should be baited with appropriate attractant like sugar solution and sweet fresh palm wine. Intensive awareness campaign should be mounted to enlighten people on the benefits of beekeeping as this will lure more people into the business. Credit/loan should be provided by commercial banks to beekeepers at reasonable interest rate. If all these measures are taken, the prospects of beekeeping in the study area will be overwhelming.

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