

SKILL NEEDS IN REJUVENATING EXISTING FORST TREES IN AN APIARY IN THE SAVANNA AREAS OF KANO STATE

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KeyWords

Blossoming, Rejuvenation, Skills, Sustainable beekeeping, Agricultural Education Students

ABSTRACT

This work was conducted in the Savanna Zone of Northwest Kano State, Nigeria, in the demonstration garden of the Federal College of Education, (T) Bichi. This study aimed to identify the skills required by agricultural education students for rejuvenation of older trees for all-year-round blossoming of flowers in an apiary. Two research questions and a null hypothesis were advanced, and the study was mixed research. The practical aspect of the work was done in the demonstration farm of the college of education, while the survey part was with a validated questionnaire, completed by modern honeybee farmers in the area and agricultural lecturers in two tertiary institutions in the zone. The findings showed that most of the skills were required by agricultural education students as they exceeded the decision mean of the study. In the test of the hypothesis, it was found that there was a significant difference in the opinion of modern honeybee farmers from that of the lecturers of agricultural education. Hence, the hypothesis that there was no significant difference in the opinion of modern honeybee farmers and that of lecturers was rejected. The report concluded with a list of recommendations. Among the recommendations were that practical teaching of apiculture be carried out with agricultural education students and that bee-loving plants should be documented for further use by local bee farmers. The formation of cooperatives is one act that can help improve bee farming in developing countries for sustainable beekeeping.

Introduction

Beekeeping/apiculture is an important component of agriculture and rural development because it provides nutritional, economic, and ecological security to rural communities at the household level. It is an agricultural activity that generates additional income for the farming community and improves the crop production through pollination. According to [7], beekeeping is a non-land-based agricultural activity that does not compete with other organisms in the area for resources (food or space). Honeybees are the only livestock that collect nectar and pollen from flowers and, with the help of different body enzymes, convert them to honey and other beneficial products. All that the honeybees require in the apiary, according to [1] and [6], is a site close to several flowering plants, a good source of clean water, and an area free from noise vibrations, dirt, and. When such an environment is presented, [19] stated that bees give out excellent products such as honey, wax, propolis, venom, bee bread, and royal jelly, aside from their very useful activities in pollination and apitherapy. Therefore, when such an environment is not available naturally, [8] opined that the farmer should create a good one for bees. This is the situation in the northern fringes, which have minimal yearly rainfall and grasses that dry up after the rains. This situation makes bees travel long distances in search of nectar and pollen, thereby reducing their productivity. Sometimes, the few trees and shrubs available may not be the honeybee plants' desires; hence, foraging bees face many challenges in making honey and other products. Moreover, the activities of local honey hunters using naked fire also destroy bees and other biotic and non-biotic organisms in the environment. Therefore, there is a need to teach and inculcate the right entrepreneurial skills and competencies to agricultural education students so that they can practice the right beekeeping skills and possibly become ambassadors of good practices for the sustainability of the enterprise. Equally, there is a need to plant, nurture, and care for desirable tree plant species that can enhance the production of honeybee products while the bees improve crop production through adequate pollination. [5] and [4] stated that the value of honey bee pollination is approximately 30–50 times the value of honey, and the monetary worth of commercial pollination in the US is estimated to be approximately 15–20 billion US dollars annually. This symbiotic relationship between plants and bees helps in balancing the ecosystem and leads to the sustainability of the environment. The tasks involved in creating the required environments for honeybees demand skills and competencies that have to be learnt, imbibed, and put to use by practitioners. These skills include, but not limited to, identification of a good apiary sit, selection of a variety of bee-loving plants, raising and nurturing them from nursery to maturity (right fertilizers and insecticides and correct dosage, thinning, weeding, pruning and protection from pests and pathogens). With regard to the provision of flowers, different types of plants: food crops, ornamentals, forest trees, and shrubs, can be planted. Other skills and competencies include construction or purchase of appropriate tools for production, harvesting, and processing.

Skills are abilities and practical knowledge about a particular task, duty, or assignment in a profession, trade, or work. They differ for varying jobs and assignments, even within the same profession. These skills include efficient use and manipulation of tools and equipment, proper management of bees to reduce stinging and absconding, identification of ripe honeycomb as opposed to brood comb, harvesting and processing, and proper marketing of produce at the right prices. In the case of apiary establishment, different skills, attitudes, and competencies are required for a prospective farmer of honeybees. Specifically, such a person should have a love and interest in honeybees and their ways of life, be a lover of nature, and keen preserver. According to [7] and [8], an ideal apiary site should be away from noisy commercial or industrial areas, located near a source of fresh clean water, have a good source of food, and a fairly dry environment that is free from floods and swamps. On his part, [14] added that an ideal apiary site is one that is secluded, exposed to full sunlight, but close to several flowering plants. It must have good air circulation and proper water drainage. He also advised that a small building where equipment and tools can be kept should be erected and has good access road. Seclusion of the apiary, as a requirement in a bee farm, must be learned by any bee farmer to reduce confrontations between bees and humans, especially in urban beekeeping. Colonies usually maintain a brooding temperature of 33 -35°C [14]; hence, they need good sunlight around them. If the hive is warm and dry, fewer bees will be needed to maintain this temperature and control disease and pests, while the majority of bees will forage for more food. Therefore, the farmer should reduce the shade to a reasonable extent so that bees will have their best performance. In the case of water supply, the beekeeper can construct water tanks of about 10 – 50 gallons at a shallow depth, fill with fresh clean water, and place twigs, straw, and leaves of plants or foam so that bees can land on them to carry/drink water. It is a fact that African bees are aggressive; hence, hives should not be placed directly inside the farm, but some 100–200 m away from crops. If otherwise, clearing weeds and pruning branches may be difficult for the farmer because his activities

will disturb the bees. Proper positioning of hives on the right type of trees or stands is a skill that should be learned.

In Rwanda, according to [9], beekeeping methods have changed into organized associations and co-operatives that train and empower members on techniques, construction of equipment, hives, and infrastructure to build their skills and improve productivity and sustainability of the profession. A similar report from Uganda [10] stated that beekeeping is being converted into co-operatives with proper training in all aspects of the profession. According to them, crude methods are being changed with modern skills to conserve and sustain trade. Hence, this study is aimed at identifying the skills required for sustainable beekeeping, especially among students of agricultural education in Kano North Senatorial Zone of Nigeria.

This study focused on the establishment of an effective apiary with flourishing flowering plants for all-year-round production that will enhance skills acquisition for agricultural education students. The specific objectives are:

1. identify skills needed in the production of new plants and the rejuvenation of older gardens that are of interest to honeybees, and
2. Identify skills involved in managing bees in an apiary for learning activities, production, and use in pollination.

Methodology

The study adopted mixed method (experimental work and survey). The population of the study was sixty-one respondents that were purposively sampled from two tertiary institutions (FCE (T) Bichi and Audu Bako College of Agriculture, Dambatta) and modern bee farmers from three LGAs of Bichi, Dambatta, and Tsayawa in the senatorial zone. In order to authenticate all the activities carried out on the farm, a questionnaire containing the required skills was prepared titled Questionnaire on the Skills and Competencies Required by Agricultural Students in the Rejuvenation of Plants and Expansion of an Apiary (QSCRASRPEA). It had two sections, A and B, with A as the bio-data and B as the main issues needed. A four-point Likert scale of Strongly Agree, Agree, Disagree, and Strongly Disagree, representing 4, 3, 2, and 1, respectively, was used to determine whether the applied practices in the practical work were in tandem with the expected skills required by students in honeybee keeping. Hence, the mean point was $(4+3+2+1) \div 4 = 2.5$ and the decision rule was $2.5 + 0.05 = 2.55$. The use of the four-point rating scale is supported by [13] to include the four extreme options because a specific user's opinion is essential in this study. The implication is that the mean responses of ≥ 2.55 were regarded as 'high responses' implying 'agreed while below 2.50 were regarded as 'low responses implying disagreed'.

Data Presentation and Discussion

TABLE 1: BIO-DATA OF THE RESPONDENTS

S/N	BIO DATA	CATEGORY	FREQUENCY	PERCNETAGE	TOTAL
1	Career	Bee farmers	26	42.6	61
		Agric. Lecturers	35	57.4	
2	Gender	MALE	42	68.9	61
		FEMALE	19	31.1	
3	Education	O/LEVEL	8	13.1	61
		DIPLOMA/NCE	11	18.0	
		B.Sc./HND	29	47.5	
		POSTGRADUATE	13	21.3	
4	Age	20-30	32	52.5	61
		31-40	24	39.33	
		41-50	3	4.9	
		51 and above	2	3.3	

Analysis of the bio-data of the respondents showed that males were more (68.9%), whereas females were 31.1%, and with educational level, all the respondents were literate, with B.Sc./HND holders having the highest percentage of 47.5%. This finding of high literacy may be due to the educational level of the respondents (lecturers and modern farmers). In terms of age, the majority of them were in their active stages of 31-40 brackets, with the

highest being 39.33%. These findings have some resemblances with earlier findings of [12] in Oyo, Nigeria, [1] in Ethiopia, and [15] in Uganda where males were more than women bee farmers and their age was 50 years. In addition, [1] reports that age, educational level, visits, and convictions from other farmers affected adoption of innovation. [11] reported that Silti Wereda bee farmers in Ethiopia were mainly males (96.25%), married (93.75%), and 77.5% of them were 21–50 years of age and had a literacy level of 60%.

Research Question 1: *What are the skills and competencies required to rejuvenate an apiary for teaching and learning beekeeping?*

TABLE 2: SKILLS REQUIRED IN REJUVENATING OLD TREE PLANTS

S/N	ITEM STATEMENT	SUM	MEAN	SD	DECISION
1	Provide appropriate maintenance for the preferred existing flowering plants	61	2.475	0.905	Disagreed
2	Screen and discard harmful plants to enhance the rejuvenation of good ones	61	2.819	0.645	Agreed
3	Identify and prepare spaces within the apiary for replanting	61	2.754	0.745	Agreed
4	Plant the desired plants at the identified locations	61	3.082	0.458	Agreed
5	Apply compost before and after transplanting seedlings	61	3.163	0.415	Agreed
6.	Water/Irrigate the whole farm during the dry season	61	3.000	0.516	Agreed
7	Do not clear/stump useful grasses and trees in the apiary	61	3.082	0.525	Agreed
8	Prune/cut older trees for better performance (branches and flowers)	61	3.098	0.472	Agreed
9	Mulch the pruned plants	61	2.868	0.784	Agreed
10	Eliminate pests attacking trees	61	2.623	0.878	Agreed
11	Maintain the apiary regularly for sustainability (food availability)	61	3.032	0.706	Agreed
12	Provide a sustainable source of water supply in the apiary (tank, bore hole)	61	3.098	0.700	Agreed
13	Prepare good baiting materials in readiness for hive baiting	61	2.983	0.532	Agreed
14	Protect seedlings in the apiary by fencing	61	3.196	0.653	Agreed

From Table 2, the skills identified were required by students of agricultural education for rejuvenating old plants in an apiary (mostly higher than the decision mean of 2.50). The only disagreed item was question R1 with 2.475, whereas the item with the highest mean of 3.196 was R14 protection of seedlings in the apiary. By implication, the majority of the items are required for skill acquisition by students of agricultural education for skills in rejuvenating older trees in an apiary, which is in agreement with [9] that skills are critical for improvement and sustainability of the business of beekeeping. Also, the experimental result from the demonstration farm corroborates the rejuvenation activities in managing the older trees. Some of these include precise pruning, earthen-up exposed roots and cutting off undesired branches, uprooting undesired trees in the apiary among others.

Research Question 2: *What skills are required to select equipment and manage an apiary for sustainability?*

Table 3: Skills required in apiary management for sustainability

	ITEM STATEMENT	SUM	MEAN	SD	DECISION
1	Site a new apiary in a place free from residential areas, noise vibrations, flood, smoke, and fire.	61	3.032	0.409	Agreed
2	A good apiary is sited in place with abundant flowering plants and a good source of fresh clean water	61	3.049	0.529	Agreed
3	Search for good-wooded hives and purchase (Langstroth, KTB, Tandem)	61	1.885	0.550	Disagreed
4	Purchase a complete bee suit (overall, thick hand gloves, veil, boots, and hats) in pairs.	61	3.180	0.591	Agreed
5	Get ready for needed equipment and tools (smokers, hive tools, knives, containers)	61	3.066	0.442	Agreed
6	Dress properly when in the apiary (inspection, harvesting, dividing colony)	61	2.721	0.640	Agreed
7	Get good baiting materials and bait the hives (unprocessed wax, honey, lavender, concoctions of barks, roots and flowers)	61	2.918	0.777	Agreed
8	Do not stand in front of the hive but by the side to avoid collision with bees going in or out of the hive	61	2.770	0.640	Agreed
9	Work quickly and quietly in pairs whenever the hive is opened	61	2.967	0.576	Agreed
10	Avoid perfume and some colours (red, black and woolly cloths) in the apiary	61	2.901	0.746	Agreed
11	Catch swarms using appropriate techniques (gently spray them water, puff smoke with a new hive/basket under the swarm)	61	2.786	0.798	Agreed
12	Locate the queen and keep her in a small container (easily traced) and transfer the colony to the hive	61	2.639	0.837	Agreed
13	Gently allow the bees to climb into the new hive after catching the swarm, not pouring them in, and give them time to settle down	61	3.065	0.512	Agreed
14	Avoid naked fire and pesticides because they destroy all (biotic)	61	3.082	0.525	Agreed
15	Keep all pests out of the apiary (lizards, spiders)	61	3.147	0.477	Agreed
16	Maintain hive hygiene and ensure proper ventilation of hive	61	3.082	0.525	Agreed
17	Divide overpopulated colonies to avoid natural swarming	61	2.836	0.662	Agreed
18	Inspect regularly and act promptly on the basis of findings (ripe honey, pest attack, planning swarming, poor ventilation)	61	2.672	0.700	Agreed
19	Harvest/Crop ripe honey promptly and appropriately (75% capped)	61	2.606	0.880	Agreed
20	Leave enough honey after harvest, especially during dearth periods	61	2.688	0.7719	Agreed
21	Process harvested honey with the right equipment	61	3.000	0.516	Agreed
22	Wax should be rendered and properly stored for industrial use	61	2.950	0.529	Agreed
23	Keep all equipment used for harvesting neat, clean, and stored well	61	3.114	0.450	Agreed
24	Processing of propolis and venom can be used for additional income	61	2.311	0.786	Disagreed
25	Keep proper records of all activities for future reference	61	2.868	0.784	Agreed
26	Bee renting for pollination provides added income and	61	2.524	0.808	Agreed

	better crop yield				
27	Apitherapy for health (use of bee products in treating ailments)	61	2.475	0.905	Disagreed
28	Regular treatment of plants against pests and diseases	61	2.442	0.785	Disagreed
29	Sustain reseeding of annual crops for all-year-round flowers for bees	61	2.409	0.643	Disagreed
30	Join beekeeping associations within and outside the locality	61	2.665	0.680	Agreed
31	Source market for products within and outside the locality	61	3.033	0.445	Agreed

The requirements in skills for managing the apiary for sustainability, as can be seen in Table 3, showed that majority of the items were required skills. Some of the key areas of sustaining beekeeping, especially among youths, are through the formation of co-operatives and associations and providing an all-year-round blossoming.

Similarly, experimental result indicated that the choice of hive, type of wood, and colour of paint of the hive was verified before purchase. The hives were baited appropriately, installed firmly to the hive stands and some on tree branches with firm cords/wire to reduce wind effects or falling off. Proper distances of 3 – 5 feet between hives were maintained with each hive facing different directions. The essence of facing the hives differently is to reduce the incidence of bees missing their own hives for another. All the management practices in beekeeping were carried out, which included inspection of hives for colonization checking for pests and controlling them, cleaning and re-baiting of non-colonized hives, clearing weeds around the hives, and providing water (good attractant especially in the Savannah zones like Bichi). To reduce the incidence of insects and other pests from climbing into the hive, the stands were shod into containers filled with grease or oil so that insects would not climb into the hives. Farm and hive hygiene were ensured, and proper recording of all activities in the apiary was performed. In support of these findings are the reports of 1 and 6 for proper flowering in an apiary. Reports from 4 and 5 identified the benefits of honeybees in crop pollination and sustainability of beekeeping. Hence, it can be seen that these skills are actually required by the youths in order to enhance improvement in beekeeping. In his own part as reported from Uganda by [10], these identified items were reported as important for growth of sustainable associations in beekeeping.

HO1: There is no significant difference between the opinion of modern honeybee farmers and lecturers of agriculture regarding the skill and competence needs of students in the rejuvenation of trees in an apiary

	Levene's Test for the Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	Df	Sig. (2-tailed)
Equal variances assumed	.085	.772	.391	68	.697
Equal variances not assumed			.391	67.889	.697

From the test of the null hypothesis, it was observed that there is a significant difference between the opinion of modern honeybee farmers and agricultural education lecturers on the skill needs in the rejuvenation of older trees. This is because the calculated value (0.772) is higher than the table value of 0.5. Hence, the null hypothesis, which stated that there is no significant difference in the opinion between modern bee farmers and agricultural education lecturers, is rejected. This difference may not be unconnected with the regular practical work of bee farmers in the apiary compared with some lecturers who may not be active in practical work in the apiary.

Recommendations

The study recommends the following on the basis of the findings of the research.

- Training intending beekeepers in the skills required for success in the art of beekeeping.
- Identify floral-rich environment with the conditions (clean fresh water, less noise and free from pollution and flood).
- Form associations and co-operatives and encourage both old and new farmers to join to increase their access to inputs, markets, loans, and other facilities.
- Increase skills in innovative activities in beekeeping such as apitherapy, pollination activities/honey renting,, and construction of bee equipment.

Conclusion

This study, which had 61 respondents, was a mixed study and was conducted in Kano State. The responses of the experts tallied greatly with the practical aspect that was carried out in the demonstration farm, which emphasized the activities involved in the rejuvenation of existing old plants and the management practices needed in the care and attention of a thriving apiary. Most of the items on the questionnaire were required by experts in both teaching and practical honeybee keeping. This shows that students of agricultural education should be exposed to practical experience in the bee farm to gain the required skills for work in the apiary. This skill training in beekeeping is especially important in the dry areas of Kano, Nigeria, as it will create the needed employment for the youth.

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