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MANPOWER TRAINING PROGRAMME AND ADOPTION OF MODERN BEEKEEPING TECHNOLOGIES AMONG RURAL BEE FARMERS IN CROSS RIVER STATE, NIGERIA

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ABSTRACT

This study ascertains the influence of manpower training programme and adoption of modern bee keeping technologies among rural bee farmers in Cross River State, Nigeria. The study adopted predictive correlation design. Two research question and two null hypotheses guided the study. The population comprised of 214 local registered beekeeping farmers within the area and was all involved in the study because of the manageable size. The study used fourteen items of structure questionnaire and open-ended interview questions was purposively administered to thirty local bee keeping farmers for data collection and was analyzed using linear regression as well as thematic analysis respectively. Both quantitative and qualitative results showed that beekeepers can be trained through various training methods including apprenticeship, and internship, programmed these methods of training equip beekeepers with the necessary skills and knowledge to perform their jobs better. that apprenticeship and internship have significant influence in the work with the adoption of modern bee keeping technologies, and that most participants preferred more interactive training methods. They found in-person mentorship. Based on the findings of this study, it was recommended that beekeepers should look closely at the benefits of adopting these methods of learning in order to grow their skills and strengthen their performance.

Key word: Beekeepers, Apprenticeship, Internship and Modern Beekeeping Training Technology.

Introduction

The potential of beekeeping (otherwise apiculture) contributes to rural economies by diversifying income sources such as through the sale of honey, bee wax, and other products. It creates jobs along the value chain, from hive construction to marketing, and it accessible due to low initial investment making it suitable for small-scale farmers and marginalized communities. It fosters cooperation through co-operatives, empowers women and youth, and can reduce rural-to-urban migration by offering local opportunities. This is demonstrated by its extensive prevalence in rural communities globally (Schouten, Lloyd, Sengere and Aranka, 2020) and its significant contributions to diversification and cash incomes among rural economies (Girma and Gardebroek, 2015; Schouten and Lloyd, 2019). Potts (2021) opined that besides keeping bees for honey and other benefits, there is a growing need for pollination service, which in many places are now worth more than the hive products themselves and contribute to maintaining biodiversity in natural ecosystems

Beekeeping is a sustainable form of agriculture that can be practiced on a local level without land ownership. It has very little start-up costs and the products (honey, wax, pollen, propolis, royal jelly, bee venom, bee brood, and others) can be sold locally. Modern beekeeping method requires low capital, it is very easy to learn, it consumes less time and it can be practiced as a small-scale sustainable agriculture as it only required a very small portion of land (Akinade, 2019). The high nutritional and therapeutic value of honey has been long appreciated and honey is widely used as a medicine, particularly by people who find it difficult to access mainstream health services (Apimondia newsletter, 2021). Honey contains vitamins, enzymes, amino acids and polyphenols and honey is known for its antioxidant activity. Honey is packed with vitamins, enzymes, and antioxidants, offering benefits like fighting microbes, reducing inflammation, and protecting cells (Pasupuleti et al., 2017; Przybyłek&Karpiński, 2019). According to the Food and Agriculture Organization (2018), there is growing demand for many bee products worldwide, provides potential employment opportunities for youth, women and the elderly. Smith and Johnson (2021) opined that beeswax is not just a random ingredient; it is a sustainable, natural resource that connects us to nature. From making your home prettier to supporting bee populations, it is a small but mighty part of daily life. It’s

being used to replace plastic wrap with reusable, natural alternatives that help cut down on waste.

Traditionally beekeeping has been a predominantly male activity in most countries. This is rapidly changing as women are actively taking part in all aspects of beekeeping from the practical activity to the marketing of products as well as training activities and active involvement in organizations (Apimondia newsletter, 2021).

There is no sustainable agriculture without bees as they are essential within the ecosystems especially in regions where intensive agriculture is practiced for the production of fruits, vegetables and seeds (Apimondia newsletter, 2021). Besides having low environmental impact and its tremendous potential to improve household livelihoods and the national economy pollination by bees generates more efficient agriculture, which drives more production that in turn promotes food security, with a greater diversity of products which, combined, offer proper nutrition. In the absence of pollinators mainly honey bees, vegetable and seed crops and tree crops yield loss was estimated to be 26 and 43%, respectively (Akinade, 2019).

Apiculture is beneficial to the environment. In fact, it provides economic reasons for the retention of native habitats. Forest beekeeping uses locally available and renewable resources and helps to involve the local people in the protection of the forest diversity. Unfortunately, beekeeping as a commercial venture is still largely unexplored in many parts of Nigeria. The practice is carried out in small-scale extensive systems, largely using traditional log hives. Despite the great efforts made to modernize the sector, the claimed production potential is still underdeveloped and the contribution of beekeeping to the improvement of rural livelihoods remains unexpressed (Carroll and Kinsella, 2013). As evident in all developing countries, apiculture in Nigeria in general and Cross River State in particular is constrained by skilled manpower to assist beekeepers in the areas of modern beekeeping. Most rural beekeepers in Cross River State, however, cannot afford to invest in inputs, process, pack, and transport their products to market to maximize profit. They produce a low-quality product that they are forced to sell locally to wholesale buyers at prices much lower than in domestic commercial markets, Low productivity and poor quality of bee products are the major economic impediments for rural beekeepers (Nwaobiala, 2014); however, they face

another primary economic concern which is lack of skill to manage their bees and bee products.

Beekeeping is open to all genders and ages and does not discriminate but it can be challenging due to the wide variety of economic impediments, pests, and diseases that can impact hive production and even kill honey bee colonies (Apimondia, 2021). This underlines the need for training. Polo, Cervai and Kantola (2018) defined training as a planned activity implemented to promote employees' learning of competencies in terms of knowledge, skills, and attitudes useful for their job or future. Today's world is incredibly complex, and technology is advancing at a breakneck pace. Johnson and Lee (2022) show that training is your ticket to not just surviving but thriving in all that chaos. It is not about ticking a box; it is a smart move to make sure you're using tech to your advantage and staying ahead of the game with everything changing so fast, training keeps your team sharp and ready to tackle whatever comes next. So, if you're really looking to stay competitive, it's worth putting some genuine effort into training and development. It's not just a checkbox it's how you grow, adapt, and keep up in today's fast-moving world.

Alawa and Okeme, (2015) explains that majority of Nigerian rural youths are literate and have potentials to practice farming if their training needs were justifiably satisfied and their interests well motivated in the profession. On their part, Abebe et al. (2008) and Akudugu et al. (2012) found a positive association between educated household heads and adoption of new practices and the intensity of adoption. This implies that households with more years of education are more likely to have access to information and are therefore amenable to the acceptance of new practices (Abebe et al., 2008; Akudugu et al., 2012). The objective of this training method, according to Samya (2021), is to strike a balance between theoretical (by educational institutes) and practical (by organizations) knowledge. Both institutions thus provide mutual help to each other. An advantage of internship is that it allows the trainee the opportunity to learn on the actual equipment in use and in the true environment of his job (Samya, 2021). The learner, therefore, gets a feel of the actual production conditions and requirements. Another advantage is that it is highly economical since no additional personnel or facilities are required for training. The trainee also learns the rules, regulations, and procedures by observing their day-to-day

applications. Samya (2021) contends that the principal disadvantage of internship training is that instruction is often highly disorganized and haphazard and not properly supervised. This is due to such reasons as the inability of the experienced employee to impart skills to the trainee, the breakdown of the job for the purpose of instructions, and the lack of motivation on the part of the trainee to receive training. Hecklé et al. (2018) found that the main criticism of internship training on modern beekeeping technologies was that they contained too much theory and lacked practice in the field.

To keep healthy bees is not an easy task, it needs continuous efforts and education, as it is the bed rock of any society (Mohammed and Umoru, 2025). Beekeepers and their family members are life-long pupils, and this education ensures work opportunities. Keeping pathogens and infections away is achieved only be sharing knowledge, through a continuous information flow. By offering workshops and symposia on bee health and through training carried out by local beekeeping organizations, beekeepers can learn of the latest techniques to better manage pests and diseases. (Apimondia newsletter, 2021). Beekeeping in Cross River State is extremely fragmented. Their traditional ways of honey production results in relatively low honey supply, yield, and poor quality than modern. Beekeepers in this area cannot compete to produce sufficiently, quality and quantity wise; utilize modern processing technologies, and access a good market. There is poor technological exchanging among honey producers in the area, and inadequate policing direction that encourage and enable honeybee keepers as a means of their source employment, income, and food value. The lack of skilled manpower, well-managed training institutions, low level and high prices of improved technology, poor post-harvest handling, poor extension services, absence of coordination among researchers, extensions, and farmers, and up-to-date information to address the problems are some of the high problems of beekeepers in the study area.

Purpose of the study

The purpose of this study is to ascertain the influence of manpower training and adoption of modern beekeeping technologies among rural bee farmers in Cross River State, Nigeria. Specifically, the study intends to find out whether:

1. Apprenticeship programme has no influence on adoption of modern beekeeping technologies in Cross River State of Nigeria.

2. Internship training programme has no influence on adoption of modern beekeeping technologies in Cross River State of Nigeria.

Methodology

The study adopted Predictive correlation design and was guided by two research question and two null hypotheses. The population comprised of 214 local beekeepers registered farmers within Akampa local government area, and 200 responded because the population was manageable. The study used fourteen items of structure questionnaire and schedules interviewed, both questionnaire and interview questions were validated by three experts in other to assess the appropriateness of the instrument in terms of sentence structured, relevance of the subject matter and its effectiveness to measure exactly what it is supposed to measure. The instrument was trial tested in 30 non-participants of the study area, using Cronbach Alpha coefficient and the overall reliability index of the instruments was found to be 0.764. Data collected were analyzed using descriptive statistics of mean and standard deviation to answered the research questions. The qualitative data was analyzed using Braun and Clarke's frame work (2006) thematic analysis to address interviewed questions, while, the hypotheses was tested at 0.05 level of significance using linear regression for null hypotheses. The decision rule for answering research questions was as follows: Very High Influence (VHI) from 4.5 – 5.00, High Influence (HI) from 3.5 – 4.49, Low Influence (LI) from 2.5 – 3.49, and No Influence (NI) from 1.5 – 2.49 The decision rule on testing the null hypothesis is reject if the null hypothesis $p \leq 0.05$ and if $p > 0.05$ do not reject the null hypothesis.

Result

Question 1

Does apprenticeship programme has influence on adoption of modern beekeeping

Table 1 Respondents' responses on influence of apprenticeship training on adoption of modern beekeeping technologies

S/N	Item Statement	$\bar{X}$	SD	Remarks
1.	Apprenticeship training is an effective method when training new bee keepers	3.55	0.96	HI
2.	Apprenticeship training provides for effective training in modern beekeeping.	3.80	1.52	HI
3.	When training new bee keepers, apprenticeship training is expensive	3.58	1.10	HI
4.	When transferring modern bee keeping technologies, apprenticeship training is time consuming.	3.80	1.77	HI
5.	have you ever participated in an apprenticeship programme related to beekeeping	3.31	1.14	LI
6.	I wear protective clothing (suits, gloves, veils) when working with bees.	2.79	1.09	LI
7.	Did the apprenticeship influence your decision to adopt any modern beekeeping technology (e.g. Modern hive, smokers, harvesting tools)?	3.81	1.22	HI
	Grand total			

Table 1 above shows the mean and standard deviation of level of apprenticeship programme has influence on adoption of modern beekeeping. The descriptive statistics in table 1 shows that 200 participated in the study with an average mean of 3.06, which indicates high level of apprenticeship programme has influence on adoption of modern beekeeping. This supports the fact that identifying areas of apprenticeship training.

Question 2

What is the influence of apprenticeship training programmeon adoption of modern bee keeping technologies

Table 2 Respondents' responses on internship training on adoption of modern bee keeping

S/N	Questionnaire Item	$\bar{X}$	SD	Remarks
8.	Internship training is an effective method of modern bee keeping technology transfer.	3.38	0.80	LI
9.	Internship training provides for the trainee's active participation in the learning process.	3.55	1.14"	HI
10.	Internship training method of acquiring modern bee keeping technology does not enhance knowledge.	3.65	1.24"	HI
11.	Taken part in any internship or field attachment related to beekeeping improved production of honey	3.12	1.34	LI
12.	I find modern beekeeping to be more efficient than traditional methods	3.41	1.15	LI
13.	Access to extension services has help me adopt modern beekeeping methods	2.88	1.07	LI
14.	I have observed an increase in honey production since adopting modern techniques.	3.71	1.00	HI
	Grand total			

Table 2 above shows the mean and standard deviation of level of internship training has influence on adoption of modern beekeeping. The descriptive statistics in table 2 shows that 200 participated in the study with an average mean of 3.06, which indicates high level of internship training has influence on adoption of modern beekeeping. This shows the respondents support for the need to identify of internship training on adoption of modern bee keeping.

Thematic analysis of Interview respond result revealed in the narrative below:

Theme 1: Knowledge transfer through Apprenticeship

Many participants stated that apprenticeship programme introduced them to modern beekeeping tools such as top-bar hives and smokers. Apprenticeships were seen as hands- on learning experiences where traditional practices were compared with modern alternatives. Six participant report that before training, they only know how to use local hives. But the experience of training showed them how to build and manage a modern hive. Out of 30 participants, 17 indicated that apprenticeship training increased their confidence in trying out new tools. However, some noted that they lacked follow up support to sustain the knowledge gained during apprenticeship.

Theme 2: Skill Development During Internship

Internship helped participants apply their knowledge in real life farm settings. Participants shared that working closely with extension officers allowed them to adopt modern practices more quickly. Eleven participants agreed that internship help them learn how to handle bees properly using protective gear and how to extract honey hygienically. a lot of respondents said internship really boosted their confidence in their skills. One person shared, after my internship, I fell so much better about handling bees. There was a clear consensus that adopting modern beekeeping tools led to better out comes. Good number of respondents revealed that training along is not enough, support structures and resources are equally important.

Hypothesis 1: Apprenticeship programme does not significant predict the adoption of modern beekeeping technologies among rural bee farmers in Cross River State, Nigeria.

Table 4a: Summary of ANOVA of Linear Regression of Apprenticeship Programme as Predictor of Adoption of Modern Bee Keeping Technologies among Rural Bee Farmers in Cross River State, Nigeria

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.251	1	4.251	24.517	.000[b]
	Residual	33.116	199	.173		
	Total	37.367	200			

b. Predictors: (Constant), Apprenticeship Programme

a. Dependent Variable: modern beekeeping technologies

Analysis in Table 4a shows the summary of ANOVA of linear regression used to test whether apprenticeship programme is a significant predictor of adoption of modern beekeeping technology among rural bee farmers in Cross River State, Nigeria. The result revealed that apprenticeship programme is a significant predictor of adoption of modern beekeeping technology among rural bee farmers in Cross River State, Nigeria, $F_{(1, 199)} = 24.517$, $p < 0.050$. Since the p – value (0.000) is less than 0.05 alpha level, we can conclude that the null hypothesis**($H0_1$)** is thus rejected. This means that apprenticeship programme significantly predicts adoption of modern beekeeping technology among rural bee farmers in Cross River State, Nigeria.

Table 4b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.337[a]	.114	.109	.41639

a. Predictors: (Constant), Apprenticeship Programme

The result in Table 4b shows a model summary which shows how the independent variable explains the variance in the dependent variable. The result shows that apprenticeship programme explained 11.4% of the variance in predict adoption of modern beekeeping technology among rural bee farmers.

Table 4c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.675	.121		22.155	.000
	Apprenticeship Programme	.190	.038	.337	4.951	.000

a. Dependent Variable: modern beekeeping technologies

The results of the regression analysis between that apprenticeship programme and adoption of modern beekeeping technology among rural bee farmers as displayed in Table 4c. The result shows a beta coefficient of 0.337 at $p<0.05$. This suggests that the apprenticeship programme significantly

predicts the adoption of modern beekeeping technology among rural bee farmers in Cross River State, Nigeria.

Hypothesis 2: Internship training programme does not significantly predict the adoption of modern beekeeping technologies among rural bee farmers in Cross River State, Nigeria.

Table 5a: Summary of ANOVA of Linear Regression of Internship Training Programme as Predictor of Adoption of Modern Bee Keeping Technologies among Rural Bee Farmers in Cross River State, Nigeria

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.577	1	4.577	26.761	.000[b]
	Residual	32.836	192	.171		
	Total	37.413	193			

a. Dependent Variable: Modern Bee Keeping Technologies
b. Predictors: (Constant), Internship Training Programme

Results of Analysis in Table 5a summarizes the results of the ANOVA and linear regression tests conducted to determine whether the adoption of modern bee keeping technologies among rural bee farmers is significantly influenced by the internship training programme. The outcome showed that adoption of modern bee keeping technologies among rural bee farmers in Cross rivers state is significantly predicted by the internship training programme, F (1, 193) =26.761, p 0.05. The null hypothesis ($H0_{1)}$ is thus rejected because the p-value (0.000) is less than the threshold of 0.05. This indicates that adoption of modern bee keeping technologies among rural bee farmers in cross rivers state is significantly predicted by the Internship Training Programme,

Table 5b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.350[a]	.122	.118	.41355

a. Predictors: (Constant), Internship Training Programme

A model summary that demonstrates how the independent variable accounts for the variance in the dependent variable is the result in Table 5b. According to the findings, 12.2% of the variation

in Adoption of Modern Bee Keeping Technologies among Rural Bee Farmers in cross rivers state could be attributed to the Internship Training Programme.

Table 5c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.490	.151		16.535	.000
	Internship Training uProgramme	.243	.047	.350	5.173	.000

a. Dependent Variable: modern beekeeping technologies

In Table 5c, the beta coefficient of regression analysis represents the correlation between the adoption of modern bee keeping technologies among rural bee farmers in cross rivers state and the internship training programme. The results show a beta coefficient of 0.350 and a significance level of less than 0.05. This implies that the internship training programme significantly predicts the adoption of modern bee keeping technologies among rural bee farmers in Cross Rivers state.

Discussion of Findings

The result of data analysis revealed that the influence between apprenticeship and adoption of modern beekeeping technologies is significant. It is also agreed with the qualitative findings which shows that diving in to hands on skill focused training really helps farmers grasp and apply modern beekeeping techniques more effective. This supports the work of Heckle et al. (2018) who found that apprenticeship is the main pathway for the transmission of traditional apicultural knowledge and skills. Apprenticeship is useful in those trades, crafts and a technical field in which long period is required for gaining proficiency. It aims at providing necessary background, practical knowledge and necessary experience to the worker. In many countries apprenticeship programs are important step into the labor market contributing to alleviate youth unemployment problem (Askilden and Nilsen, 2005). According to Tansel and Ogawa (2008), the objective of this training method is to improve the attractiveness of the participant to potential employers or to enable them to establish their own business. Apprenticeship helps to maintain a skilled workforce; increase employees' loyalty and opportunities for growth; it also lowers the

hiring cost because of reduced turnover and lower production costs (Samya, 2021). Some of the disadvantages are that apprentices typically receive significantly lower pay (if at all they get paid) than certified or professional workers, despite often sharing in the same basic projects and tasks (Chron, 2020). Apprentices also typically don't get much, if any, of the recognition from clients or customers (Chron, 2020), and this is a challenge for an ambitious apprentice. According to the same author, even though you do get to complete a lot of hands-on work, some apprentices are limited from engaging in some types of activities by legal or practical standards.

The result of data analysis revealed that the influence between internship and adoption of modern beekeeping technologies is significant. This result supports the work of Anjum (2020) who stated that internship programs not only improve students' personal skills but also polish their professional growth and experience. Under internship training, technical institutions and organizations jointly impart training to their members (Samya, 2021).

Conclusion

Based on the result of the analysis of data, the quantitative analysis findings revealed that there is a significant relationship between apprenticeship, internship and adoption of modern beekeeping technologies in rural Cross River State respectively. However, the above qualitative result affirmed, that most participants preferred more interactive training methods. They found in person mentorship, and that despite exposure to training, some farmers did not adopt modern technologies due to cost, lack of equipment access, or cultural beliefs.

Recommendations

The following recommendations were made in line with the findings of the study.

1. Adequate training in modern beekeeping technologies should be provided for rural beekeepers and modern beekeeping equipment and accessories made accessible.
2. Extension services should be strengthened down to the village level to inform farmers about beekeeping and the new technologies in order to increase the rate of adoption.

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