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# EFFECT OF TRAINING OF WOMEN BEEKEEPERS ON PRODUCTION OF BEEHIVE PRODUCTS IN OGUN STATE, NIGERIA

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## ABSTRACT

The study investigated the effect of training on production of bee-hive products by women beekeepers. The specific objectives were to describe the socioeconomic characteristics of the women beekeepers in the study area, examine beekeepers' access to training, determine the percentage of the beekeepers producing each of the bee hive products, and determine the influence of training on production of bee-hive products. A total of 107 women beekeepers were randomly selected as respondents for the study. Data were collected with the use of a structured questionnaire and analyzed using descriptive statistical tools and logit regression analysis. Results on socioeconomic characteristics show that the beekeepers were relatively educated. Friends and relatives, respectively were the most reported marketing outlets and source of information used by the beekeepers. The majority of the beekeepers did not belong to beekeeping cooperative group and lacked access to extension services. About 68% of the beekeepers had access to training. Apart from honey and bee-wax only very few beekeepers produced other bee-hive products and secondary products. At P>0.01, training positively affected the production of honey (0.100), bee-wax (0.116), bee venom (0.584) and number of secondary products produced (1.378). It however negatively influenced the production of propolis (-0.423) and pollen (-0.298). On the basis of these findings, it is recommended that intensive training programmes on production of different bee-hive products should be given topmost priority for profit maximization and economic diversification.

**Keywords:** Training, Beekeeping, Bee-hive products, Secondary-products

## INTRODUCTION

Agriculture is a fundamental instrument for stemming and reversing the worsening poverty, food insecurity and natural resources degradation trends in sub–Saharan Africa (Asogwa *et al.,* 2012). Globally, agriculture provides livelihoods for more people than any other industry. About eighty percent of Nigerians live in rural areas (Nwankpa, 2017) and engage in agricultural production at subsistence level. Ajamu *et al.* (2016) reported that women constitute nearly half of the adult population of Nigeria and 77% of them live in the rural area. The major occupation of rural women is agriculture and its related activities. They have been actively involved in crop production as well as livestock rearing. Women are also involved in beekeeping in recent time.

In most African countries, beekeeping has often been a male dominated enterprise due to a mix of cultural and social factors, as well as practical constraints, that limit women's participation (Mujuni *et al.,* 2012). However, with the intervention from development agencies, a change in beekeeping practices has occurred. The introduction of stingless bees and use of Langstroth bee hives have encouraged women participation in beekeeping. In addition, due to the introduction of the Langstroth hives that are hoisted near the ground, bee care and bee-hive product harvesting could be carried out during the day alongside household chores without climbing the trees, which is culturally unacceptable for women.

Beekeeping is relatively inexpensive and easy to start. A woman can manage a small apiary only with little assistance from someone during harvesting. It is a seasonal activity and inspection can be done at spare time. These attributes make beekeeping an attractive economic pathway out of poverty for the rural poor, particularly women who lack productive resources.

Apiculture is the practice and management of the bees in hive to produce honey and other products including bee wax, propolis, bee-venom and royal jelly (Alarape *et al.,* 2020). All over the world, beekeeping is an integral part of agriculture. Bees are of inestimable value as agents of pollination and many plants are entirely dependent on them. To buttress this, Lietaer (2010) stated that many ecosystems depend on the pollination of bees for their existence and for increasing their genetic diversity (cross-pollination). An estimated eighty percent of flowering plants are entomophilous i.e. depending more or less on insect pollination to be able to reproduce, and it is estimated that half of the pollinators of tropical plants are bees (Bradbear, 2011). Farmers benefit from bee pollinated roles in the ecosystem as bee pollinate 70% crop species (Klein *et al.,* 2007) that feed 90% of the world population.

Bees produce a good number of hive products (propolis, royal jelly, pollen, honey etc.) that are rich in nutrient, valuable in producing food supplements and also have medicinal properties. Furthermore, beekeepers can use bee-hive products to make value added products like candles,

lotion, honey beer and wine, honey soap etc., which help beekeepers to diversify sources of income. Honey, beeswax and their derivatives, such as candles, wine etc. have cultural value in many societies and may be used in rituals for births, marriages, funerals and religious celebrations. Production of bee-hive products, processing and value addition can benefit both beekeepers and non-beekeepers through bee-based businesses (cottage industries). Adeola, *et al.,* (2011) asserted that many non-beekeepers also generate income from other bee-based businesses like honey packaging, beekeeping equipment manufacturing, research, cosmetic and food service industries.

In spite of the number of hive-products of diverse economic value produced by bees, many beekeepers do not possess the skills and technical know-how to harvest and process all the products that bee offers. Furthermore, many of them do not know their economic value. Yemane and Taye, (2013) attested to the fact that beekeepers often throw away bee-wax because they don't know what to do with it. Bee-wax, pollen, propolis etc can be an excellent opportunity for beekeepers to maximize profit and obtain sustainable income. However, given the lack of knowledge and skills to produce high value bee-hive products, the potential benefit of beekeeping as a business enterprise is not realized. Training and re-training will help to bridge this gap.

Norsida *et al.,* (2016) define training as systematic development of the attitude, knowledge, skills and behavior pattern required for the performance of a given task. Saleh and Man (2017) asserted that for rapid improvement in the agricultural sector, personnel training is essential in order to combat the problem of poor skills. Technology advances in bee farming necessitate training and re-training from time to time to keep beekeepers abreast of beekeeping innovations. In view of the above, the study seeks to determine the effect of training on production of bee-hive products among women beekeepers in Ogun State. The specific objectives of the study are to:

i. describe the socioeconomic characteristics of the women beekeepers in Ogun state;
ii. examine beekeepers' access to training;
iii. determine the percentage of the beekeepers producing each of the bee-hive products; and
iv. determine the influence of training on production of bee-hive products.

## METHODOLOGY

The study was conducted in Ogun State, Nigeria. The state is located between latitude 3°30' to 4 ° 20 North and longitude 6 ° 30 to 7 ° 30 East. It shares common boundaries with Lagos State to the South, Oyo and Osun states to the North, Ondo state to the East and Republic of Benin to the West. It has a tropical rainfall pattern, starting around March and ending in November. Agriculture is the main occupation of the people. Ogun state Beekeepers Network Group was the sampling frame because it is the main body for all beekeepers in the study area. A total of 107 beekeepers were randomly selected from 214 female members of the group. Data were collected using structured questionnaire and analyzed using mean, percentages and logit regression analysis. The effect of training on the production of bee-hive products was determined using logit regression model depicted thus:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \text{----------} \beta_6 X_6$

Y = Training, where lack of access to Training =0; Access to training =1

$X_1 – X_6$=Bee-hive primary and secondary products produced by each beekeeper

$X_1$=Honey (L), $X_2$=Bee-wax (Kg), $X_3$=Pollen (Kg), $X_4$= Bee-venom (L), $X_5$=Propolis (Kg)

$X_6$= Number of secondary products, $\alpha$ = Constant, $b_1$-$b_6$= Coefficients.

## RESULTS AND DISCUSSION

### Socio-economic characteristics of the women beekeepers

**Table 1: Distribution of beekeepers according to selected socio-economic characteristics**

| | Socioeconomic characteristics | Frequency | Percentage | Mean |
|---|---|---|---|---|
| **Education**: | No formal education | 4 | 3.7 | |
| | Koranic education | 3 | 2.8 | |
| | Primary education | 30 | 28.0 | |
| | Secondary | 37 | 34.5 | |
| | Post-secondary | 33 | 31.0 | |
| **Membership of Cooperative (years**): | Does not belong | 79 | 74.0 | |
| | 1-4 | 17 | 16.0 | |
| | 5-8 | 9 | 8.0 | 4.82 |
| | >9 | 2 | 2.0 | |
| **Marketing outlets:** | Friends and relatives | 57 | 53.3 | |
| | Stores/shops | 46 | 43.0 | |
| | Traditional homes/church | 20 | 18.7 | |
| | Farm site | 19 | 17.8 | |
| | Local market | 16 | 15.0 | |
| | Cooperative | 11 | 10.3 | |
| | Hawking | 4 | 3.7 | |
| | Road side | 2 | 1.9 | |
| **Sources of information:** | Friends and relatives | 48 | 44.9 | |
| | NGOs | 43 | 40.2 | |
| | Radio | 34 | 31.8 | |
| | Television | 31 | 29.0 | |
| | Cooperative | 28 | 26.2 | |
| | Research Institute/University | 27 | 25.2 | |
| | Written publications | 27 | 25.2 | |
| | Internet | 17 | 15.9 | |
| | Extension agents | 2 | 1.9 | |
| | Seminars | 4 | 3.7 | |

Education influences people's awareness, perception, reception, adoption of innovations, and their ability to view and comprehend new ways of doing things to improve their living condition.

Result in Table 1 revealed that 3.7% of beekeepers had no formal education while 2.8% of the beekeepers had koranic education. Another 28% of the beekeepers had primary education. Beekeepers that had secondary and post-secondary level of education were 34% and 31% respectively, cumulating to 65.5%. The beekeepers within this educational level should be able to view and comprehend new ways of carrying out their bee-farming to improve their production for maximum return of input. This finding is similar to that of Adefalu, *et al.* (2013) who found that majority of the farmers in the study areas had one form of formal education. Table 1 also shows that 74% of the beekeepers did not belong to any beekeeping cooperative group. A probe into how long the beekeepers had been in their groups revealed that 16% had been members of beekeeping cooperative between 1-4 years. Response for 5-8 years and greater than 8 years' membership were reported by 8% and 2% of the beekeepers respectively. A mean of 4.82 years was obtained for membership of cooperative society.

The production of any commodity is incomplete until the commodity concerned reaches the ultimate consumers. Therefore, producing bee-hive products for profit and growth of the beekeeping sector of the economy is highly dependent on successful marketing. Findings on marketing outlet in Table 1 indicated multiple responses. The most reported sales outlet were friends and relatives (53.3%) while 43% made sales via stores/shops. Sales via traditional homes and churches were reported by 18.7% of the beekeepers. Selling at farm site and local market were reported by 17.8% and 15% of the beekeepers respectively. Selling via cooperatives were reported by 10.3% beekeepers. Another 3.7% and 1.9% of beekeepers sold their bee-hive products by hawking and at road side respectively. From the different marketing outlets reported, it could be inferred that the beekeepers use marketing outlets that probably attract low price for their produce.

Information is an important input for production. Rural women often suffer from acute low productivity, due to ignorance, which is a direct consequence of either inadequate or total lack of information. Sources of information used by the beekeepers in Table 1 indicated multiple responses. Friends and relatives (also beekeepers) were reported by 44.9%. NGOs, radio, television and cooperative were reported by 40.2%, 31.8%, 29% and 26.2% respectively. Furthermore, 25.2% each reported research Institute/University and written publications as their sources of information while internet was reported by 15.9% of the beekeepers. The limited use of these sources of information could be attributed to the educational status of the beekeepers since only 31% of them had post-secondary education (Table 1). About 1.9% reported extension

agents as their source of information. Similar result was obtained by Micheal (2008) who noted that fellow beekeepers were the major (80%) and extension agents were least (10%) sources of information used by beekeepers. Another 3.7% of the beekeepers reported seminar as their source of information. Finding corroborates the assertions of Swanson and Rajalahti (2010); Owolabi *et al.,* (2011) that less than 10% of women farmers had access to agricultural extension communication sources.

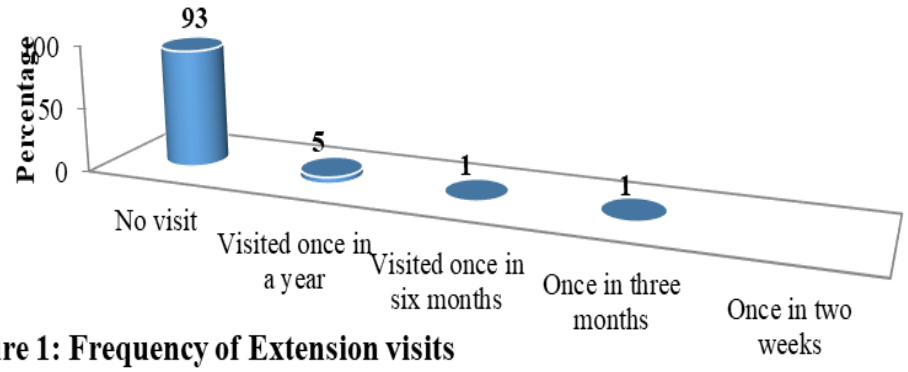


**Figure 1: Frequency of Extension visits**

Agricultural extension services constitute a driving force for any agricultural development. The relationship between agricultural extension agent and the farmer is an important determinant in the adoption and sustenance of improved farm practices such as beekeeping. Figure 1 shows that majority (93%) of the beekeepers were not visited. About 5% of the beekeepers were visited once in a year. Another 1% each of the beekeepers were visited once in six months and once in three months, respectively. Based on findings, it can be inferred that extension services on beekeeping are grossly inadequate among beekeepers in the study area.

**Table 2: Distribution of beekeepers according to nature of extension services**

| Extension Services received | Frequency | Percentage |
|---|---|---|
| No visit (lack of extension services) | 99 | 93.3 |
| Swarm control | 2 | 1.9 |
| Wax processed to get secondary products (candle, cream) | 1 | 0.9 |
| Bee rearing | 3 | 2.8 |
| Proper use of insecticide by beekeepers and crop farmers | 2 | 1.9 |
| Honey used as additive in baking | 2 | 1.9 |
| Labeling | 1 | 0.9 |
| Honey classification | 1 | 0.9 |
| **Total** | ***MR** | ***MR** |

***MR**=*Multiple responses*

The nature of extension services received by the beekeepers was investigated and presented in Table 2. Overwhelming majority (93.3%) did not benefit from extension services. Swarm control and wax processing to get secondary products were reported by 1.9% and 0.9% of the beekeepers respectively. Bee rearing was reported by 2.8% of the beekeepers; proper application of insecticide and use of honey as additive in baking with 1.9% each. Labeling and honey classification was reported by 0.9% each.

**Table 3: Distribution of beekeeper according to reasons for lack of extension visits**

| Reasons for lack of extension visits | Frequency | Percentage |
|---|---|---|
| OGADEP does not have well trained agent for beekeeping | 32 | 30.2 |
| Extension agents for beekeeping are not available in my locality | 17 | 16.0 |
| No interest | 15 | 14.2 |
| I prefer to seek for assistance from my NGO | 14 | 13.2 |
| I don't need the services of extension agent | 4 | 3.8 |
| The time for extension program is not convenient | 6 | 5.7 |
| It is easier to get assistance from my NGO than extension agents | 9 | 8.5 |
| I am more knowledgeable in beekeeping than extension agents in the zone | 13 | 12.3 |
| **Total** | ***MR** | ***MR** |

***MR**=*Multiple responses*

Inquiry into reasons for lack of extension visits was made and presented in Table 3. "Ogun State Agricultural Development Programme (OGADEP) does not have well trained extension agents for beekeeping" and "extension agents for beekeeping are not available in my locality" were the top-most reasons reported by the beekeepers with a score of 30.2% and 16% respectively. "No interest" scored 14.2% while "I prefer to seek for assistance from my NGO" scored 13.2%. The least reasons given were "I don't need the services of extension agent for my beekeeping" and "the time for extension programs is not convenient" with a score of 3.8% and 5.7%, respectively. "It is easier to get assistance from my NGO than from extension agents" had a score of 8.5% and "I am more knowledgeable in beekeeping than extension agents in the zone" had a score of 12.3%.

**Women Beekeepers' Access to Training**

**Table 4: Distribution of beekeepers according to training**

| | Training | Frequency | Percentage |
|---|---|---|---|
| | Not trained | 41 | 38.3 |
| **Trained by:** | Extension agents | 5 | 4.7 |
| | Cooperative | 13 | 12.1 |
| | Other beekeepers | 10 | 9.3 |
| | Beekeeping NGOs | 52 | 54.2 |
| | Public workshops | 6 | 5.6 |
| | **Total** | ***MR** | ***MR** |

***MR**=*Multiple responses*

The result of the investigation on training was presented in Table 4. Findings revealed that 38.3% of the beekeepers did not receive any training on beekeeping. Results of the analysis further showed that 4.7%, 12.1% and 9.3% were trained by extension agents; cooperative and other beekeepers, respectively while 54.7% of the beekeepers were trained by a number of beekeeping NGOs and 5.7% were trained at workshops.

**Table 5: Distribution of beekeepers according to types, frequency and relevance of training**

| | Training | Frequency | Percentage |
|---|---|---|---|
| **Type of Training:** | Candle making | 8 | 10.8 |
| | Cream making | 7 | 9.5 |
| | Soap making | 4 | 8.0 |
| | Polish making | 2 | 5.4 |
| | Making of label for packaging | 5 | 6.8 |
| | Wax extraction/molding | 5 | 6.8 |
| | Apitheraphy | 7 | 12.2 |
| | Queen rearing methods | 6 | 10.8 |
| | Harvesting/processing products | 10 | 16.2 |
| | Colony management | 8 | 13.5 |
| **Frequency of training:** | Very rare | 2 | 3.0 |
| | Rare | 28 | 42.0 |
| | Often | 19 | 29.0 |
| | Very often | 17 | 26.0 |
| **Relevance of training:** | Very relevant | 38 | 58.0 |
| | Relevant | 27 | 41.0 |
| | Not relevant | 1 | 1.0 |

Further investigation on types of training received was made (Table 5). Training received on making of candle, cream, soap and polish using bee-wax scored 10.8%, 9.5%, 8% and 5.4%, respectively. Making of label and wax extraction/molding into definite shape, respectively scored 6.8% each. Apitherapy and queen rearing methods scored 12.2% and 10.8%, respectively. Methods of harvesting/processing bee products and bee colony management scored 16.2% and 13.5% respectively. Results on frequency of training revealed that 3% and 42% of the beekeepers, respectively indicated very rare and rare while 29% and 26% indicated often and very often, respectively (Table 5). Inquiry was also made into the relevance of training received. More (58%) of beneficiaries reported that training was very relevant. Another 41% of them reported that the training was relevant. Despite the report of the majority, 1% of the beekeepers reported that training received was not relevant (Table 5).

**Production of bee-hive products**

**Table 6: Distribution of beekeepers based on the production of each bee-hive products**

| | Honeybee Production | Frequency | Percentage |
|---|---|---|---|
| **Bee-hive primary products** | Honey | 107 | 100.0 |
| | Bee wax | 73 | 68.0 |
| | Propolis | 13 | 11.0 |
| | Pollen | 8 | 7.0 |
| | Bee venom | 8 | 7.0 |
| **Bee-hive secondary products** | Soap | 4 | 3.7 |
| | Candle | 2 | 1.9 |
| | Cream | 2 | 1.9 |
| | Shoe polish | 1 | 1.0 |

Investigation into the production of bee-hive products is presented in Table 6. All (100%) the beekeepers produced honey and 68% of them produced bees-wax. Furthermore, 11% of the beekeepers produced propolis and another 7% of the beekeepers produced pollen and bee venom, respectively. It can therefore be inferred that honey and bee wax were the major bee products produced by the beekeepers. Comparable study by Serda *et al.* (2015) pointed out that the only hive product harvested and utilized by beekeepers was honey while Amulen (2019) revealed that honey, bee-wax and propolis were the harvested products by the beekeepers in their study. Findings on secondary bee-hive products indicates that 3.7% of the beekeepers produced soap. 1.9% each produced candle and cream while 1% of the beekeepers produced shoe polish. Findings of this study revealed that the beekeepers in the study area produced limited

bee-hive secondary products. This finding is in agreement with Hans *et al.*, (2018) that only 3% and 1% of the beekeepers made candles and hand creams respectively as bee-hive secondary products.

**Effect of training on production of bee-hive products**

**Table 7: Logit result on effect of training on production of bee-hive products**

| Variables | Regression coefficient | SE | Level of Significance |
|---|---|---|---|
| Honey | 0.100 | 0.029 | 0.001*** |
| Bee wax | 0.116 | 0.037 | 0.002*** |
| Bee venom | 0.584 | 0.207 | 0.005*** |
| Secondary products | 1.378 | 0.640 | 0.031** |
| Propolis | -0.423 | 0.155 | 0.006*** |
| Pollen | -0.298 | 0.135 | 0.027** |

***, ** p<0.05, SE=Standard Error; $X^2$ value=51.91*** Percentage predicted correct=78.5

The result of the Logit regression analysis on the relationship between training and production is shown in Table 7. The estimated coefficients of honey, bee-wax, bee venom and secondary bee-hive products respectively were .100; .116, .584 and 1.378 and statistically significant. The estimated coefficients of propolis and pollen were -.423 and -.298, respectively and statistically significant. Training showed a positive effect on honey, bee-wax, bee venom, and number of secondary bee-hive products produced by the beekeepers. The positive effect means that training enhances production of these products. This is probably because people will participate in what they know and have assured market for. Honey is commonly consumed as food. Honey and bee venom are also used in traditional medicine while secondary bee-hive products (candle, soap, cream and shoe polish) are daily used at homes. Apart from domestic uses, these products, if produced in commercial quantity have industrial uses. Training had a negative effect on pollen and propolis, indicating that training does not enhance the production of pollen and propolis. The probable reason for this finding might be lack of interest by the beekeepers to produce pollen and propolis compared to honey. This assertion is supported by Serda *et al.* (2015) that the beekeepers only harvest honey.

## CONCLUSION

Training has both positive and negative effects on the production of bee-hive products. The positive effect enhances the production of honey products and its derivatives for profit maximization and economic diversification. However, the negative effect of training on pollen and propolis implies a disincentive.

## RECOMMENDATIONS

Based on findings of this study, it is recommended that intensive training program on production of different bee-hive products should be of topmost priority offered to beekeepers by Ogun State beekeeping NGOs.

Extension services is grossly inadequate in the study area. For more beekeeping-extension coverage, Ogun State ADP should train more staff on bee-farming with specific focus on how to produce as many bee-hive products that bee offers and their derivatives.

The study established that only few beekeepers belong to beekeeping cooperative. Beekeeping cooperative should be strengthened for annexing information on the value of all bee-hive products from government, non-government organizations, and research institutes that are into beekeeping. The women leader of Ogun State beekeeping NGOs should encourage beekeepers that are not members of beekeeping cooperative to join one.

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