



## EFFECT OF TRAINING ON THE USE OF MODERN BEEKEEPING TECHNOLOGIES IN OYO STATE, NIGERIA

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### ABSTRACT

*The Oyo State Ministry of Agriculture, Natural Resources and Rural Development recently trained producers on the use of modern beekeeping technologies with the aim of enhancing their global competitiveness. This paper examined the effectiveness of the training programme. Multistage sampling procedure was used in selecting 131 trained beekeepers from the 3 senatorial districts in Oyo state. The data collected were analysed with the aid of descriptive and inferential statistics. The study revealed that Beekeepers had 6±4 mean years of experience, 74.6% of beekeepers had between 1 and 10 years of experience; 61.1% got their initial capital from personal saving and information about beekeeping and training was from a variety of sources with a higher percent (43.5%) from beekeepers association. Increased quantity of honey produced (1.92) was the most important benefit derived from the use of the technology while, invasion by Fulani herdsmen (1.68) and lack of credit facilities (1.40) were the major constraints to use of modern beekeeping technologies. There was significant difference in the level of use of modern beekeeping technologies before and after the training ( $t=18.419$ ;  $p\leq 0.050$ ). The training was effective as there was increased use of modern beekeeping technologies after the training. It is recommended that the training should be replicated in other states and for other agricultural enterprises and government should formulate policy that will guide grazing of livestock to reduce invasion of Fulani herdsmen*

**Keywords:** Training effectiveness, modern beekeeping technologies, constraints to beekeeping

### INTRODUCTION

Bees are one of the most important organisms on Earth; they belong to the Order *Hymenoptera* which includes the honey bees, bumble bees, stingless bees, and carpenter bees. Although there are over 20,000 species of wild bees, the species usually managed by beekeepers is the Western honey bee (*Apismellifera adansonii*) which is common in West Africa in general, and Nigeria in particular. This species are very prolific honey producers and are managed by beekeepers for honey and other bee products (Olorunyomi, 2009). Beekeeping is as old as any agricultural practice and has been an alternative source of income to farmers especially in rural communities. However, Ojeleye (2003) observed that commercial beekeeping was almost non-existent in Nigeria until recently despite Nigeria's high potential for beekeeping, due to its excellent flora and fauna diversity. Beekeeping exists in almost all states in Nigeria, yet majority of its production are on subsistence level. These producers make use of gourd hives, pot, basket, straw hives, and sometimes, hollow tree trunks. Also during harvesting, the hives are crudely broken-into using smoke to suppress the bees without ensuring that harvesting was due. Many times, eggs, larvae and pupa are harvested along with honey and the comb, which often lead to poor-quality of products, delay in time of re-colonization of hive by bees and sometimes total absconding from the hive by the bees. These numerous disadvantages led to the invention of modern beekeeping technologies.

Modern bee-keeping technologies are suitable for commercial beekeeping and will enable local producers compete favourably in production with

other producers on the global scene. Hence, the Department of Rural Development under the Oyo State Ministry of Agriculture, Natural Resources and Rural Development trained beekeepers in Oyo state on the use of modern beekeeping technologies from 19<sup>th</sup>-22<sup>nd</sup> April 2011 with the help of Subject Matter Specialists (SMSs). The training also involved giving of incentives which included: the provision of modern beehives (which allow the beekeeper to examine the comb before harvesting), harvesting kits and honey extraction machine. Since the use of modern beekeeping is beneficial to beekeepers and the training was taken over two years ago, the benefits and effect of the training are expected to be obvious. One will then wonder why the market is still dominated with traditionally produced bee products. It is against this backdrop that this study was designed to investigate the effect of the training on the use of modern beekeeping technology among beekeepers in Oyo State.

The specific objectives are to:

1. examine the enterprise characteristics of trained bee keepers,
2. identify constraints to the use of modern beekeeping technologies,
3. ascertain the benefits of the use of modern beekeeping technologies; and
4. compare the level of use of modern beekeeping technologies before and after the training.

### METHODOLOGY

**Area of study** - Oyo state is located in the South-West geopolitical zone of Nigeria. It was one of the three states carved out of the former Western State of Nigeria in 1976. The State consists of 33



Local Government Areas and has a population of 5,591,589 people (National Population Commission, 2006). Oyo State covers a total of 27,249 square kilometres of land mass and it is bounded in the south by Ogun State, in the north by Kwara State, in the west it is partly bounded by Ogun State and partly by the Republic of Benin, while in the east by Osun State. The landscape consists of old hard rocks and dome shaped hills, which rise gently from about 500 meters in the southern part and reaching a height of about 1,219 metres above sea level in the northern part. The climate in the State favours the cultivation of crops like Maize, Yam, Cassava, Millet, Rice, Plantain, Cocoa tree, Palm tree and Cashew.

**Population of the study** - The population comprised 394 participants trained by the

Table 1: Summary of sampling procedures and sample size of the study

Selected senatorial district	Number of LGA	45 % of LGA	Names of selected LGA	Number of Trainee	65% Proportion of Trainee	Cum. Total
Oyo Central	11	5	Egbeda	31	20	20
			Lagelu	18	12	32
			Ibadan North	17	11	43
			Ibadan West	21	14	57
			Ibadan South-East	19	12	69
			Iseyin	14	9	78
Oyo North	13	6	Kajola	20	13	91
			Saki-west	18	12	103
			Irepo	12	8	111
			Ogbomoso North	15	10	121
			Ogbomoso South	19	12	133
Cumulative Total						133

**Measurement of variables**

**Dependent variable - Effect of training on modern beekeeping technologies**

Fourteen (14) modern technology practices from the training were listed and respondents were asked to indicate which of the practices they used before the training and after the training. This was measured using “No” and “yes” response options and scored 0 and 1 respectively. Respondents’ scores were computed to generate scores for use before training and use after training. The scores for before training and after training were subtracted to get the effect of the training, the effect score was categorized into high effect and low effect using the mean.

**Independent variable - Enterprise characteristics of trained beekeepers**

- Years of experience: Respondents were asked to indicate in year(s) how long they have been practicing beekeeping.
- Sources of capital: respondents were asked how they raised their initial capital to start beekeeping enterprise: personal savings, family and friends, loan and cooperative society

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**Sampling procedure and sample size**

Multistage sampling procedure was used to select respondents for the study. Out of the 3 senatorial districts in Oyo state, Oyo North and Oyo Central were purposively selected due to the larger number of participants in the training. A proportionate sample of 45% of the LGAs was selected in the selected senatorial district: 5 and 6 LGAs from Oyo Central and Oyo North respectively. Finally 65% of the total trainees were sampled randomly to give a total of 131 trained beekeepers for the study.

- Sources of information: respondents were asked how they heard about the training on modern beekeeping training from a list of sources of information which were: family and friends, beekeepers association, television, newspapers, radio, extension agent.

- Membership of beekeepers association: respondents were asked if they are members of Beekeepers Association of Nigeria, Oyo State chapter.

**Involvement in beekeeping enterprise**

- Number of hives: respondents were asked to state the total number of beehives in their apiary/apiaries. The hives were categorized based on standard size: large, medium and small sizes.

**Constraints faced by trained beekeepers in using modern beekeeping technologies**

Fifteen (15) possible constraints to use of modern beekeeping technologies were listed. Respondents indicated the severity of these constraints on a 3-point rating scale of 2, 1 and 0 for “severe constraint”, “mild constraint”, and “not a constraint”. The mean scores were computed and



used to rank from the most severe constraints to the least severe.

**Benefits of using modern beekeeping technologies**

Fifteen (15) possible benefits of using modern beekeeping technologies were presented to respondents. These benefits were measured on a 3-point rating scale of 2, 1 and 0 for “great benefit”, “small benefit” and “no benefit”. The mean score for each benefit item were used to rank these benefit from the greatest to the least.

**Method of data collection and analysis**

Primary data were collected from the respondents using well-structured questionnaire. Data collected were analysed with the aid of descriptive statistical tools which include frequencies, percentage distribution and mean. The hypotheses tested for significance difference between use of modern beekeeping technologies before and after training, this was analysed using paired sample t-test.

**RESULT AND DISCUSSION**

**Enterprise characteristics of trained beekeepers**

Result on Table 2 presents the enterprise characteristics of respondents. It reveals that a larger percent (39.7%) had between 5 and 9 years of experience and 35.1% had less than 4 years of experience. This implies that majority (74.6%) of the trained beekeeper had less than 10 years of beekeeping experience which suggest that that commercial beekeeping is a relatively new enterprise in the area. This supports the findings of Matanmi *et al* (2008), who reported that majority of beekeepers are new in the enterprise.

Table 2 also reveals that 61.1% of the respondent got their initial capital from personal savings. This is in line with the findings of Folayan and Bifarin (2013) that most agricultural enterprises depend on personal savings as start-up credit.

It was also revealed that information on training was from a variety of sources with a larger percentage from beekeepers association 43.5% while, family and friends had 30.5%. Furthermore, majority (85.0%) of the trained beekeepers are members of Beekeepers Association of Nigeria (BAN) Oyo State chapter.

Table 2: Distribution of respondents by enterprise characteristics

Enterprise characteristics	Frequency	Percent ages	Mean
<b>Years of experience</b>			
Less than 4 years	46	35.1	6±4
5-9 years	52	39.7	
10-14 years	29	22.1	
15-19 years	4	3.1	
<b>Source of capital</b>			
Personal Savings	80	61.1	

Enterprise characteristics	Frequency	Percent ages	Mean
Family and Friends	10	7.6	
Loan	29	22.1	
Cooperative Society	12	9.2	
<b>Source of information on training</b>			
Family and friends	40	30.5	
Beekeepers Association	57	43.5	
Television	8	6.1	
Newspapers	2	1.5	
Radio	10	7.6	
Extension Agent	14	10.7	
<b>Membership Beekeepers Association of Nigeria</b>			
Yes	111	85.0	
No	20	15.0	

Source: Field survey, 2013

**Involvement in beekeeping**

The distribution of hives is very important for this study because it is an indicator of the involvement of the respondents in beekeeping. Table 3 reveals that the number of hives possessed by a respondent ranged between 2 and 100 hives. The mean number of hives was 16 ±14 hives, more than half (62.6%) of trained beekeepers possessed between 2 and 16 hives. The hives were categorised into: large, medium and small based on their standardized measurement known to the respondents and those who construct hives. Table 2, further reveals that 60.6% of respondents used medium hives, 28.0% used small hives while only 25.2% used large hives. This implies that use of medium hives is most used hive among respondents. This is likely because medium hives was the recommended hives from the training are most convenient to use.

Table 3: Distribution of respondents based on involvement in beekeeping enterprise

Beekeeping enterprise characteristics	Frequency	Percentages	Mean
<b>Number of hives</b>			
2-16 hives	82	62.6	16 ±14
17-31 hives	38	29.0	
32-46 hives	5	3.8	
47-61 hives	5	3.8	
Above 61hives	1	0.8	
<b>Hive categories</b>			
Large hives	33	25.2	
Medium hives	82	60.6	
Small hives	36	28.0	



Total 131 100

Source: Field survey, 2013

**Benefits derived from of use of modern beekeeping technologies**

Table 4 reveals that increased quantity of honey produced ranked highest among the benefits derived from the training, followed by the benefit of retaining the bees' colony after harvesting and improved quality of honey. This implies that the

most prominent advantage of using modern beekeeping was increased production of honey from hive, as the ultimate reason for engaging in beekeeping was for increased production of honey which will generate more income and improve the livelihood of beekeepers. This corroborates GEF (2009) which posit that increased production of honey is leading to the improvement of beekeepers' livelihoods

Table 4: Distribution of respondents by benefits derived from the use of modern beekeeping technologies

SN	Statements	Great Benefit		Small Benefit		No Benefit		Mean	Rank
		F	%	F	%	F	%		
1.	Increased quantity of honey produced	121	92.3	9	6.9	1	0.8	1.92	1 <sup>st</sup>
2.	Improved quality of honey	119	90.8	11	8.4	1	0.8	1.90	3 <sup>rd</sup>
3.	Easier access to apiary	118	90.1	9	6.9	4	3.1	1.87	4 <sup>th</sup>
4.	Retains bees colony after harvesting	119	90.8	12	9.2	0	0.0	1.91	2 <sup>nd</sup>
5.	Natural biodiversity conservation	74	56.5	53	40.5	4	3.1	1.53	9 <sup>th</sup>
6.	Lower production cost	49	37.4	62	47.3	20	15.3	1.22	15 <sup>th</sup>
7.	Early discovery of swarming.	64	48.9	42	32.1	25	19.1	1.30	14 <sup>th</sup>
8.	Easy inspection of hive.	76	58.0	32	24.4	23	17.6	1.41	12 <sup>th</sup>
9.	Prevents aggressiveness of bees	81	61.8	37	28.2	13	9.9	1.52	10 <sup>th</sup>
10.	Less bee stings on humans	91	69.5	35	26.7	5	3.8	1.66	6 <sup>th</sup>
11.	Better assessment of colonies	80	61.1	46	35.1	5	3.8	1.58	7 <sup>th</sup>
12.	Prevent the harvesting of brood (eggs, larvae, pupae)	95	72.5	11	8.4	25	19.1	1.54	8 <sup>th</sup>
13.	better evaluation of beekeeping as a business	89	67.9	19	14.5	23	17.6	1.50	11 <sup>th</sup>
14.	Increase in shelf-life of bee products	79	60.3	27	20.6	25	19.1	1.41	12 <sup>th</sup>
15.	Safer bee-product for human consumption	110	84.0	19	14.5	2	1.5	1.82	5 <sup>th</sup>

Source: Field survey, 2013

**Constraints to use of modern beekeeping technologies**

The result on Table 5 reveals that invasion by Fulani herds men ranked highest in order of severity among the constraints to the use of modern beekeeping technologies; this was because hives were placed in the farm and forest vegetation which exposed them to Fulani herdsmen searching for green pasture for their herds. The results also reveal that lack of credit facilities and high cost of standard equipment ranked second in order of severity, this implies that high cost of purchasing some of these modern technologies such as honey extraction machine and kits, discouraged

beekeepers from use of modern technologies to the latter. This supports the findings by Ouma *et al* (2006), that prominent among problems affecting the use of improved agricultural technologies by farmers was access to credit; as farmers who have access to credit are more likely to use improved technology innovations compared with farmers who do not have access to credit. This is because use of improved technologies may require extra resource commitment that can only be met through acquisition of credit facilities.

Table 6: Distribution of respondents by constraints to use of modern beekeeping technologies

SN	Constraints items	Not a constraint		Mild constraint		Severe constraint		Mean	Rank
		F	%	F	%	F	%		
1.	Land tenure problem.	28	21.4	39	9.8	64	48.9	1.28	7 <sup>th</sup>
2.	Un-colonization hives.	24	18.3	71	54.2	36	27.5	1.09	9 <sup>th</sup>
3.	Frequent absconding of bees	21	16.0	60	45.6	50	38.2	1.22	8 <sup>th</sup>
4.	Invasion by Fulani herds men	6	4.6	30	22.9	95	72.5	1.68	1 <sup>st</sup>
5.	Bush burning	17	13.0	54	41.2	60	45.8	1.33	5 <sup>th</sup>



SN	Constraints items	Not a constraint		Mild constraint		Severe constraint		Mean	Rank
		F	%	F	%	F	%		
6.	Pest invasion	20	15.3	52	39.7	59	45.0	1.30	6 <sup>th</sup>
7.	Lack of credit facilities	9	6.9	61	46.6	61	46.6	1.40	2 <sup>nd</sup>
8.	Unavailability of standard equipment	38	29.0	59	45.0	34	26.0	0.97	11 <sup>th</sup>
9.	Ineffective extension services	18	13.7	93	71.0	20	15.3	1.01	10 <sup>th</sup>
10.	Fear of bee stings	60	45.8	58	44.3	13	9.9	0.64	15 <sup>th</sup>
11.	High cost of standard equipment	22	16.8	35	26.7	74	56.5	1.40	2 <sup>nd</sup>
12.	Theft	28	21.4	31	23.7	72	55.0	1.34	4 <sup>th</sup>
13.	Diseases infestation	48	36.6	54	41.2	29	22.1	0.86	13 <sup>th</sup>
14.	Bee swarming	24	18.3	91	69.5	16	12.2	0.94	12 <sup>th</sup>
15.	Climate change	54	41.2	65	49.6	12	9.2	0.68	14 <sup>th</sup>

Source: Field survey, 2013

**Respondent's use of modern beekeeping technologies before and after training**

Information on Table 7 reveals that before training only 12.2% of respondents used modern hive compared to 89.3% after training, 13.7% used of hive tools to loosen the cover and top bar glued by the bees before training compared to 85.5%

after training, also 18.3 % of respondents wore a pair of hand gloves during harvesting and bee-suit when examining hive compared to 82.4% of the respondents after training. This implies that after training there was increased use of modern beekeeping technologies among respondents.

Table 7: Distribution of respondents by use of modern beekeeping technologies before and after training

S/No	Modern beekeeping technologies	Before Training		After Training	
		F	%	F	%
1.	Use of modern hive ( Kenya or Tanzania top bar)	16	12.2	117	89.3
2.	Placing of hive far from vicinity of inhabited area.	35	26.7	76	58.0
3.	Use of swarm catchers.	48	36.6	89	67.9
4.	Use of hive tools to loosen the cover and top bar glued by the bees	18	13.7	112	85.5
5.	Wearing a pair of hand gloves during harvesting	24	18.3	108	82.4
6.	Use of honey extraction machines	12	9.2	99	75.6
7.	Packaging honey in air tight container	57	43.5	70	53.4
8.	Examination of comb before harvesting	22	16.8	100	76.3
9.	Sieving of honey during processing	27	20.6	101	77.1
10.	Keeping record of colony development	12	9.2	100	76.3
11.	Assessment of stock of bees on hive	10	7.6	100	76.3
12.	Use of smoker in harvesting	19	14.5	103	78.6
13.	Wearing of bee-suit when examining hive	24	18.3	108	82.4
14.	Apiary sited within 1km radius of flowering vegetation	31	23.7	105	80.2

Source: Field survey, 2013

**Effectiveness of training**

Hypothesis on Table 9 was set to test for significant difference between use of beekeeping technologies before and after training. It reveals that there was significant difference between use of modern beekeeping technologies before training

and after training (t-value =18.419, p-value=0.000) with mean of 7.9. This implies that the training was effective because more trained beekeepers adopted the use of modern beekeeping technologies after the training.

Table 10: Paired sampled t-test between the levels of use before training and the level of use after training.

Hypothesis	Mean	SD	Df	t-value	p-value	Decision
Difference in use before training and after training	7.9	4.8999	130	18.419	0.000	Significant difference



#### CONCLUSIONS AND RECOMMENDATION

This study concluded that training on use of modern beekeeping was effective as there was significant difference in use of modern beekeeping technologies before training and after training. Information on training was sourced mainly through beekeepers association while, personal saving was the major source of credit. The benefit derived most from the use of the modern beekeeping technology was increase in quantity of honey produced. Invasion by Fulani herdsmen and lack of credit facilities were the major constraints to the use of the modern beekeeping technologies. It is therefore recommended that, the training should be replicated in other states and for other agricultural enterprises also government should formulate policy that will guide grazing of livestock such as setting up of grazing centres for cattle should be set up so as to reduce invasion of Fulani herdsmen into apiaries

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