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# Utilization of Improved Bambara Nut (*Vigna Subterranea*) Production Technologies by Farmers in Nsukka Agricultural Zone, Enugu State, Nigeria

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**Nzeakor, F. C.**
Department of Agricultural Extension and Rural Development,
Michael Okpara University of Agriculture, Umudike, Nigeria

**Ukoha, J. C. I.**
Department of Agricultural Extension and Rural Development,
Michael Okpara University of Agriculture, Umudike, Nigeria
*Corresponding author's email joyciroukoha@gmail.com

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**ABSTRACT**
*The study analyzed the utilization of improved bambara nut (vigna subterranea) production technologies by farmers in Nsukka Agricultural Zone, Enugu State, Nigeria. A multi-staged sampling procedure was used in selecting 120 bambara nut farmers that participated in the study and structured questionnaire was used to elicit information from them. Both descriptive and inferential statistics were used in analyzing the data. Major results showed that majority (80%) of the respondents got their agricultural information from friends and fellow farmers, while less than 40% of the respondents had direct contact with extension workers. About six different bambara nut production technologies were disseminated to farmers. However, the extent of utilization of the technologies was very low as the mean scores of all the production technologies fell below the bench mark of 2.50 on a 4-point Likert-type scale and the grand mean score of 1.88. Furthermore, the result showed that the output mean of bambara nut per annum was 462.8 kg which was low. The hypothesis results also showed that there was no significant relationship between farmers' extent of use of bambara nut production technologies and output of farmers in the area. The study concluded that farmers' extent of utilization of the improved bambara nut production technologies was very low probably resulting to low bambara nut output per annum. Therefore, Extension should repackage the production technologies to meet the felt needs of bambara nut farmers thereby increasing the extent of utilization of the improved technologies for increased output.*

***Keywords: Bambara nut, Utilization, Farmers' output, Improved production technologies***

## INTRODUCTION

The dissemination of improved agricultural technologies to farmers is expected to increase their output at the end of each farming season especially as agricultural extension offers farmers advisory services that will assist them select the best possible options and take appropriate decisions in order to achieve optimum production in their farming activities. Abou (2015) stated that the extension goal was to help small-scale farm households, mostly among the rural poor, improve their livelihoods by increasing their farm income and achieving household food security. Similarly, Obinna (2015) noted that Nigeria still requires improved farming technologies such as application of inorganic fertilizers to boost agricultural production to enable her feed her teeming population. The benefits of improved technology to agricultural development are realized in terms of increased farm output, higher income, and improved standard of living (Hart *et al*., 2005). Hence, increased output is highly dependent on the dissemination of improved agricultural technologies to farmers. However, there has been reduction in farmers' output despite the improved technologies disseminated to farmers by extension agents. As a result of this slow growth in output, Nigeria moved from a food sufficient country in the 1960s to a major importer of food in the 1980s (Onogwu *et. al*., 2017). Most times farmers report the issues of late arrival and distribution of farm inputs, difficulty in accessing the extension services which are most often costly for the average farmer to afford. Also, most technologies transferred to farmers are not economically beneficial, therefore are inappropriate for farm level application. They do not meet farmers' needs and are sometimes socially unacceptable to the resource poor farmers. Those that plan and extend their extension services to farmers hardly identify with farmers and farmer's anxieties because little attention is paid to understanding of farm level realities (Munyua, 2000).

Bambara nut (*Vigna subterranea*) is an African indigenous pulse that is predominantly cultivated in sub-Saharan Africa by small scale farmers. It is cultivated by most farming households in the Southern savanna belt of Nigeria. The drought-resistant crop has gained commercial and nutritional relevance in Nigeria due to the sustainable livelihood outcome it furnishes and the demand for the highly relished, ready-to-eat, steamed food (*Okpa*) produced from it (Agbonlahor *et al*., 2018). Also, Mkandawire (2007) and Jieani (2016) agreed that the crop can produce reasonable yields under marginal conditions, making it potentially highly beneficial to resource poor farmers by being ''a good backstop for hungry times''. *Bambara* nut has been referred to as an indigenous solution to Africa's food crisis, as it provides an almost complete food source. Bambara nut is a good source of protein, and is high in the essential amino acid lysine, which is often low in cereals, thus making it an effective food source for complementing a cereal based diet (Baudoin and Mergeai, 2001; Omoikhoje, 2008).

The Enugu State ADP sought to increase Bambara nut output through the dissemination of improved technology to farmers as well as other extension services to be delivered to the Bambara nut farmers for increased productivity. Yet, Bambara nut production seems not to be high as expected annually. Moreover, Amarea *et al.* (2016) opined that improving the productivity, profitability, and sustainability of smallholder farming is considered the main pathway out of poverty. However, Ogunwale *et al.* (2006) and Anuranjan *et. al*. (2017) observed that farmers who engage in this bambara nut faming as their primary occupation face myriads of problems just like other crop farmers. These problems include: lack of awareness about availability of extension services, lack of confidence on information furnished by extension agents, unavailability of information in local and understandable language and lack of good/updated content in local language. Similarly, Amarea *et al.* (2016) noted that poor smallholders face a number of constraints that limit their productivity such as lack of information about production methods and market opportunities, particularly for new crops and varieties which prohibit households from intensifying agriculture and producing high-value commodities whose market demand is growing rapidly; and poor access to credit and/or insurance can also limit uptake of new technologies.

What is the extent of use of the improved Bambara nut technologies transferred by Enugu State ADP to farmers in the state? Did the utilization of the technologies reflect positively in the

production output of the farmers? These were the questions the research answered in order to proffer solutions to assist technology developers and disseminators.

***Objectives of the Study were to:***

1. assess sources of agricultural information available to Bambara nut farmers;
2. ascertain the annual output of Bambara nut farmers; and
3. ascertain the extent of use of improved Bambara nut production technologies by the respondents.

**METHODOLOGY**

The study was conducted in Nsukka Agricultural Zone,Enugu State, Nigeria. Nsukka agricultural zone is one of the three agricultural zones in Enugu state, Nigeria. It is made up of six LGAs namely: Nsukka, Igbo-Eze North, Igbo-Eze South, Isi-Uzo, Udenu and Uzo-Uwani. Enugu State has a good soil-land and climatic conditions all year round, sitting at about 223 meters (732ft) above sea level, and the soil is well drained during its rainy season. The mean temperature in Enugu State in the hottest month of February is about 87.16°F (30.64°C) while the lowest temperatures occur in the month of November, reaching 15.86°C. The lowest rainfall of about 0.16 cubic centimeters (0.0098 cu in) is normal in February, while the highest is about 35.7 cubic centimeters (2.18 cu in) in July. Nsukka had a population of 309,633 people at the census held in 2006 (Post Office, 2009). However, the population of the study includes all Bambara nut farmers in Nsukka Agricultural Zone Enugu State, Nigeria.

A multi-stage random sampling procedure was adopted for the selection of respondents for this study. Three out of the six LGAs were purposively selected for the study based on the existence of Bambara nut farmers in the areas. They included Nsukka, Isi-Uzo and Uzo-Uwani LGAs. Also, two communities were purposively selected from each of the three LGAs for the same reason. They included Nsukka and Eha-Alumona for Nsukka LGA; Eha-Amufu and Umuero for Isi-Uzo; Nkpologu and Adani for Uzo-Uwani LGA. Furthermore, 20 farmers from each community were randomly selected for the study based on their involvements in Bambara nut farming. This gave a total of 120 respondents.

Data for the study were collected through the use of questionnaire and were analyzed using descriptive and inferential statistics. Objective (i): sources of agricultural information available to bambara nut farmers and (iii): annual output of bambara nut farmers were analyzed using descriptive statistics, while objective (ii): extent of use of bambara nut production technologies was analyzed using a 4-point likert type of rating scale namely: Very great extent = 4, Great extent = 3, Low extent = 2 and Very low extent = 1. The bench mark was obtained thus: 4+3+2+1 = 10, divided by 4 to give 2.5 mean score. This implies that any mean score responses above the bench mark were adjudged as very high extent of use of bambara nut production technologies which include technologies on chemical application, fertilizer application, field preparation technologies, planting distance, harvesting technologies and supply of improved nut varieties by the respondents while any mean score responses lower than the bench mark were viewed as otherwise. To test the hypothesis, Correlation analysis was used to measure the degree of association between farmers' extent of use of bambara nut production technologies and the output of bambara nut farmers in the study area. The model is given thus:
Where:

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - ((\sum x)^2 . n(\sum y^2) - (\sum y)^2}}$$

r = Correlation coefficient
*Y* = Farmers' extent of use of bambaranut production technologies (Mean Score)
*X* = Output of bambaranut farmers
n = Sample Size

## RESULTS AND DISCUSSION

### Sources of agricultural information available to the bambara nut farmers

Results in Table 1 show the sources of agricultural information available to Bambara nut farmers in the study area. The result shows that 68.3% got information from Cooperative Societies; while 35.8% of the respondents received information from the radio. About 23% got agricultural information through their phones. Others were, 16.7%, 15.8%, 13.3%, 12.5%, and 7.5% had their sources of agricultural information from television, newspapers and magazines, agricultural shows, institutes, as well as books/leaflets/posters respectively. However, the results revealed that majority (80%) of the bambara nut farmers got their information from friends and fellow farmers while less that 40% of the respondents had direct contact with extension workers in Nsukka agricultural zones of Enugu State. This showed that there was low level of extension presence in the area that made farmers resort to second-hand level of information from their fellow farmers and friends. The implication of this result is that the farmers in the study area were not substantially exposed to proven technical innovation which should increase their productivity. This result agreed with that of Ukoha and Nzeakor (2016), that the level of extension contact among farmers in the area was low. Owomso *et al*. (2011) opined that frequent extension contacts will enhance exposure of farmers to improved production packages thereby agreeing with the findings of Odoemelam *et al*. (2016), that extension contact is expected to have a positive influence on farmers' investment decisions on agricultural technologies.

**Table 1: Distribution of Respondents According to Sources of agricultural Information Available to the Bambara nut Farmers** **n = 120**

| Extension services | Yes | No |
|---|---|---|
| Radio | 43(35.8) | 77(64.2) |
| Television | 20(16.7) | 100(83.3) |
| Extension workers | 45(37.5) | 75(62.5) |
| Cooperative society | 82(68.3) | 38(31.7) |
| Friends and fellow | 96(80.0) | 24(20.0) |
| Newspapers and magazine | 19(15.8) | 101(84.2) |
| Agriculture shows | 16(13.3) | 104(86.7) |
| Institutes | 15(12.5) | 105(87.5) |
| Books/leaflets/posters | 09(7.5) | 111(92.5) |
| Phones | 27(22.5) | 93(77.5) |

Source: Field Survey, 2018. Note: the figures in *parenthesis are the percentages should be put as footnotes using superscripts like***

### Bambara nut production output per annum

Entries in Table 2 show the distribution of respondents according to bambara nut production output per annum. From the result, 35.8% of the bambara nut farmers had annual output of 500 to 699 kilogrammes of bambara nut; 32.5% of the farmers' output stood at 300 and 499 kilogrammes; 22.5% had an output of between 100 and 299 kilogrammes while 9.2% of the bambara nut farmers had an output range of 700 and 899 kilogrammes for the season under review. The mean production output of bambara nut per annum in the study area was 462.8 kilogrammes. This implies that the output is not high. Balarabe (2018) reported that bambara nut farmers in Gombe State, Nigeria, harvested a minimum of 1000kg per ha at the end of 2018 farming season. However, according to Onogwu *et al.* (2017), there has been a slow growth in output of agricultural produce making Nigeria to become major importer of food since 1980. Similarly, Ekumankama (2019) observed that there have been several efforts over several decades to avail farmers with beneficial research based on agricultural technologies but they do not seem to have yielded the expected impact. Nevertheless, Nmadu, *et al*. (2015) stated that the efficiency of extension organizations in providing information to farmers on improved technologies will play a significant role in the level of farmers' innovation uptake with respect to crop production. Therefore, if majority of the challenges faced by bambara nut farmers in utilizing the production packages from extension are properly addressed, the farmers annual production output will definitely increase.

**Table 2: Distribution of Respondents according to the Production Output of Bambara nut per annum (n = 120)**

| Output (kg) | Frequency | Percentage | Mean ($\bar{x}$) |
|---|---|---|---|
| 100-299 | 27 | 22.5 | |
| 300-499 | 39 | 32.5 | |
| 500-699 | 43 | 35.8 | 462.8 |
| 700-899 | 11 | 9.2 | |

Source: Field Survey, 2018

**The Extent of utilization of improved bambara nut production technologies by farmers**

The result in Table 3 shows the extent of utilization of bambara nut production technologies by farmers in the study area. With the bench mark of 2.50 mean score, the results specifically indicated mean scores of 2.30, 2.10, 2.10, and 2.00 for harvesting technologies; fertilizers application; Planting distance and supply of improved nut varieties respectively. Similarly, mean scores of 1.90 and 1.70 were for the use of technology on chemical application and field preparation technologies respectively. The result implies that the extent of utilization of bambara nut production technologies by farmers in the Zone was very low as the mean scores of all the production technologies extended to farmers were lower than the bench mark means scores of 2.50 on a 4-point scale and the grand mean score of 1.88, which also was very low. Therefore, there was very low utilization of extension production packages by the respondents. Amarea *et al.* (2016) observed that extension may, in many cases, have little impact on production among the poorest farmers. However, this could be due to various constraints that hinder farmers from accessing and utilizing most of the extension packages such as issues on late arrival and distribution of farm inputs, lack of awareness about availability of extension services, difficulty in accessing the extension services, lack of confidence on information furnished by extension agents, unavailability of information in local and understandable language, lack of good/updated content in local language among others.

**Table 3: Distribution of Respondents according to the Extent of Utilization of improved bambara nut Production Technologies** **n =120**

| Items | VGE | GE | LE | VLE | Total | Mean |
|---|---|---|---|---|---|---|
| Technologies on chemical application | 8 (32) | 29(87) | 28(56) | 54(54) | 229 | 1.9 |
| Fertilizer application | 13(52) | 29(87) | 33(66) | 45(45) | 250 | 2.1 |
| Field preparation technologies | 8 (32) | 12(36) | 31(62) | 69(69) | 199 | 1.7 |
| Planting distance | 8 (32) | 29(87) | 44(88) | 39(39) | 246 | 2.1 |
| Harvesting technologies | 16(64) | 30(90) | 51(102) | 22(22) | 278 | 2.3 |
| Supply of improved nut varieties | 15(36) | 29(87) | 43(86) | 33(33) | 242 | 2.0 |
| **Grand mean score = 1.875 ≈ 1.88** | | | | | | |

Source: Field Survey, 2018. Note: Bench-mark mean score is 2.50. Key: VGE= VERY GREAT EXTENT, GE= GREAT EXTENT, LE=LOW EXTENT, VLE=VERY LOW EXTENT

**Test of Hypothesis**

The result of Correlation analysis shows a non-significant relationship between farmers' extent of use of bambara nut production technologies and output of bambara nut farmers. Therefore, the null hypothesis which states that there is no significant relationship between the farmers' extent utilization of bambara nut production technologies and output of bambara nut farmers is hereby accepted and the alternative (Ho) rejected. This result however collaborates with the earlier results on the extent of utilization of the improved production technologies, and the production output results which showed that the extent of utilization was low therefore resulting to no significant relationship between utilization of production technologies and the bambara nut output.

**Table 4: Correlation analysis of the relationship between the farmers' extent of utilization of improved bambara nut production technologies and their production output of per annum**

| | | | OUTPUT | USE |
|---|---|---|---|---|
| Spearman's rho | OUTPUT | Correlation Coefficient | 1.000 | .086 |
| | | Sig. (2-tailed) | . | .351 |
| | | N | 120 | 119 |
| | USE | Correlation Coefficient | .086 | 1.000 |
| | | Sig. (2-tailed) | .351 | . |
| | | N | 119 | 119 |

Source: Field Survey, 2018

## CONCLUSION

Findings from the study showed that majority of the respondents got their agricultural information from friends and fellow farmers while few bambara nut farmers had direct contact with extension workers. Also, farmers' extent of utilization of the bambara nut production technologies in the Zone was very low as all mean scores of the production technologies extended to bambara nut farmers were lower than the bench mark mean score of 2.50. This negatively affected the bambara nut production output in the area. Similarly, the Correlation analysis shows a non-significant relationship between farmers' extent of utilization of bambara nut production technologies and the production output of bambara nut farmers. This further portrayed that increased output is highly dependent on the effective dissemination and proper utilization of improved agricultural technologies.

## RECOMMENDATIONS

Therefore, based on the findings, it is recommended that:

1. Extension should repackage the improved bambara nut production technologies transferred to farmers to be more economically beneficial, socially acceptable to the resource poor farmers and more appropriate for farm level application. This will help meet bambara nut farmers' production needs and possibly increase the extent of utilization of those technologies.
2. Bambara nut farmers should be re-oriented on why information from Extension is more authentic and reliable in carrying out their production activities for increased income.

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