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# SMALL SCALE BANANA FARMERS' AWARENESS LEVEL AND ADOPTION OF IMPROVED BANANA VARIETIES IN DELTA STATE, NIGERIA

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## ABSTRACT

*The general objective of the study was to determine smallscale banana farmers' access to and adoption of improved planting materials in Delta State, Nigeria. Over the last two decades banana production in Nigeria has been on the decline. It was against this background that this research was carried out to assess the awareness of and use of improved planting materials by small scale farmers in Delta state. A multi-stage sampling procedure was used to select a total of two hundred and forty (240) banana farmers for the study. A well-structured and validated questionnaire was used to collect data from respondents. Descriptive statistics and binary logit regression were employed for data analyses. The results show that although majority of the farmers (96.67%) were aware of and had access to improved banana varieties, only 15.83% of them adopted the use of improved planting materials. Gros mitchel, Cavendish and sweet bananas were the major sources of improved banana varieties. The result further indicated that several constraints like cost of obtaining planting material (X= 4.80), climatic factors (X= 4.78), biological factors (X=4.60), palatability of the local cultivars over improved ones (X= 4.59), poor soil conditions (X =4.46) and socio-economic characteristics of the farmers(X = 4.11) as militating against the adoption of improved banana varieties. The study concluded that the adoption level of improved banana was low and recommended, among others, that major constraints hindering the small scale farmers from adoption of improved banana for planting should be addressed.*

**Key words:** small scale, banana farmer, adoption, improved, Delta state DOI: http://dx.doi.org/10.4314/jafs.v14i1.6

## INTRODUCTION

Banana (*Musa paradisiaca*) belongs to the family of plants called *Musaceae*. The commonly grown bananas differ from their wild relatives by being seedless (reproductive features of flower are dysfunctional) and parthenocarpic (Heslop-Harrison and Schwarzacher, 2007). *Musa acuminata (AA* genome) and *Musa balbisiana (BB* genome) are the two main progenitors of cultivated banana varieties (Robinson, *et al.*, 2007).

In Nigeria, bananas (*Musa* spp.) are predominantly grown by small-scale farmers for food security and income (Wambugu *et al.,* 1988). Western Nigeria accounts for 64.4 % of production while Central and Eastern Nigeria account for 26 % of production (Qaim, 1999). The average banana yield in Nigeria is low; this is put at 14 tons ha-1. This is less than one-third of the crop's potential under favorable conditions (Qaim, 1999). A wide range of genetic diversity is found in Nigeria for both dessert and cooking bananas depending on region (Mbaka *et al.,* 2008). In Central Nigeria the crop is mainly grown for income generation whereas in Nyanza, Kenya, it is mainly grown for food (AATF, 2009). Cooking varieties include Uganda green, *Ng'ombe, Nusu ng'ombe, Mutahato* and *Gradi shiskame* while dessert varieties include apple banana (Ndizi sukari), Bokoboko, giant Cavendish, Chinese Cavendish, Gros Michel, Kampala, Bogoya and Muraru (Spilsbury et al, 2003; MOA, 2005). Factors like tastes, eating habits, market demand and environmental conditions tend to affect their distribution (Nguthi *et al.,* 1999).

Despite the importance of the crop in food security and income generation yields are still very low (<20 t ha-1 year-1) (FAO, 2009) compared to the potential yields of about 70 t ha-1 year-1 (Van Asten *et al.,* 2005). Lack of enough high quality planting material is one of the reasons for this low production. The use of local cultivars has not been able to meet the high demand for the crop. To increase banana production there is therefore a need to use improved planting materials (Lopez, 1994).

Increasing agricultural productivity is one way of alleviating poverty in Nigeria especially in rural areas. Among the agricultural crops that show great potential for increased production is banana (*Musa* spp*).* Therefore growing high yielding varieties of banana can go a long way to alleviate hunger. The crop has an advantage as it does not require much labour compared to other crops. Production begins within 14 months from planting and may last up to decades or more, thus bringing reliable family income with low labor input. Once the crop is established harvesting is done throughout the year rather than a short period of time. It is also a suitable intercrop and provides stability and shelter for other crops thus is suitable for environmental conservation (Wambugu and Kiome, 2001). Over the last two decades banana production in Nigeria and the Eastern Africa region has been on the decline (MOA, 1994). Could it be as a result of the fact that farmers do not plant improved varieties? The assessment of the level of awareness and adoption of improved cassava varieties in Delta State has not been carried out. It is therefore necessary to ascertain farmers' access to and adoption of improved varieties of banana in the study area. This constitutes a research gap which warrants investigation. It is against this background that this research was carried out to assess the awareness of and use of improved planting materials by small-scale farmers in Delta state. The policy recommendation that will emanate from the study will help to boost food security and income generation among small scale farmers.

The general objective of the study was to determine small-scale banana farmers' access to and adoption of improved planting materials in Delta State, Nigeria. Specific objectives were to:

i. describe the socio-economic characteristics of the respondents,
ii. determine small-scale banana farmers' access to and adoption of improved planting materials,
iii. identify the types of improved planting materials used by farmers in the area,
iv. ascertain sources of improved planting materials adopted by farmers, and
v. determine the factors militating against small-scale banana farmers' adoption of improved varieties

The study tested the following hypothesis, stated in the null form.

$Ho_1$**:** There is no significant relationship between the socioeconomic characteristics of the farmers and their adoption of Improve varieties.

## METHODOLOGY

The study was carried out in Delta State, Nigeria. Delta State was purposively selected because of the preponderance of banana farmers in the state and proximity to the researcher. The state lies roughly between longitude $5^{o}$00,' $6^{o}$45' East and latitude $5^{o}$00,' $6^{o}$30' North. It has an estimated population of about 4,098,391 persons (NPC, 2006) and total land area of about 17,440 square kilometers. The average rainfall is about 2000mm per annum with an average monthly temperature of $33^{o}$C and a relative humidly varying from 57-90 percent annually. Delta state is sub-divided into three agricultural zones - Delta South, Delta North and Delta Central.

A multi-stage sampling procedure was used for the study. The first stage was the random selection of six Local Government Areas, two from each agricultural zone since. The selected Local Government Areas (LGAs) included: Aniocha North and Ika South in Delta North; Ethiope East and Ughelli South in Delta Central; and Patani and Isoko North in Delta South. Next was the random selection of small-scale banana farmers from each of the six selected LGAs. Forty farmers were randomly selected by balloting from each of the six selected LGAs. Thus, a total of two hundred and forty (240) respondents were used for the study. A well-structured and validated questionnaire was used to collect data from respondents.

### Measurement of variables

The dependent variable of this study is farmers' "Adoption" of improved banana varieties. Farmers were asked to indicate Yes or No depending on whether they use improved varieties or not. Frequency counts and percentages were then used to interpret the data generated. The Likert-Scale used to measure the constraints has the values: 5 = very serious; 4 = serious; 3 = neutral; 2 = not serious; 1 = not very serious. A mean score of 3.00 and above was regarded as serious constraints while mean score below 3.00 was regarded as not too serious as used by Akwiwu *et al* (2000).

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**Model Specification**

The model for this study which was used to test the stated hypothesis was the logit regression (also known as the logit analysis). Logit model is a technique for estimating the probability of an event that can take one or two values (yes 1, no = 0). The model assumes that the dependent variable follows a logistic distribution.

For the purpose of this study, binary logit regression was used. Binomial (or binary) logit regression is a form of regression which is used when the dependent variable (in this study the adoption level) is dichotomous. The binary logit model assumes that the dependent variable follows a logit distribution; the logistic regression equation can be simply specified as:

$$= {}_0 + {}_1 {}_1 + {}_2 {}_2 + {}_3 {}_3 + {}_4 {}_4 + {}_5 {}_5 + {}_6 {}_6 + {}_7 {}_7 + {}_8 {}_8 + \quad \text{..... (1)}$$

or

$$Y_{i = F(Zi) = F}[b_o + \sum^{n}_{i=1} b_i X_i] = [\frac{1}{1 + -(b + \sum)}]$$

where

$Y_i$ = (1, probability of respondent i using improved variety; 0, otherwise)
$b_0$ = Constant
bi = $b_1$,$b_2$,$b_3$…$b_7$ = respective coefficients
$X_1$ = Age (in years)
$X_2$ = Gender (1, male; 0, otherwise)
$X_3$ = Marital status (1, married; 0, otherwise)
$X_4$ = Educational level (number of years of schooling)
$X_5$ = Farming experience (number of year in farming business)
$X_6$ = Farm size (in hectares)
$X_7$ = Household sized (in numbers)

## RESULTS AND DISCUSSION

**Socio-economic Characteristics of Banana Farmers**

The socio-economic characteristics of the respondents are presented in Table 1. Age of farmers ranged from 17 – 79 years. Majority (32.08%) of the farmers was within 51-60 years age group and the mean age was about 47 years. However banana production was mainly carried out by farmers who were in the economically active age group. Ogungbile, *et al.* (2002) asserted that farmers in this range of age were always active and this could lead to positive effect on banana production. Most of the respondents, 74%, were males; 26% were females. This may be due to the perennial nature of banana crop which often leads to

permanent holding on land which traditionally is owned by men. Ebewore (2012) also had similar observation on cocoa farmers in Edo and Ondo states, Nigeria.

Majority of the respondents, 66.67%, were married. This showed that marriage was highly valued among the banana farmers. Ebewore (2012) obtained similar result for cocoa farmers in Edo State. Majority of the respondents, 95%, could read and write. Njoku (1991) observed that formal education has a positive influence on adoption of innovation. Omoregbee, (1996) and van de Ban and Hawkins (1996) had similar observation.

Majority of farmers were experienced in farming; about 52.18% of them had over 10 year experience as farmers. The average farming experience was 12 years. Ogungbile, *et al.* (2002) indicated that length of time of farming business can be linked to the age of farmers, access to capital and experience in farming may explain the tendency to adopt innovations and new technology. Farm sizes in the study area were rather very small with about 96.25% operating small holding of 4.0 hectares and below. According to Alamu *et al* (2002) farmers with more resources including land are more likely to take advantage of a new technology. Fragmentation due to land tenure systems, nearness to farms and resource endowment of farmers may be responsible. The finding agrees with that of Onemolease (2005) who observed that the average farm size was 1.2 hectares in Edo State, Also, Okunlola and Adekunle (2000) asserted that 53% of Nigerian farmers have less than 4 hectares of land. The average farm size was 0.78 hectares. The implication of this finding is that majority of the banana farmers operate small holdings. The household sizes were large, with 74.85% of the farmers having more than 5 members in their household. The average household size was 6 members. Alamu and Rahman (2002) reported that the adoption index may be either positively or negatively related to the household size depending on the nature of the age structure and the amount of labour contributed among members.

**Small Scale Banana Farmers' Access to and Adoption Level of Improved Planting Materials**

Table 2 shows the respondents level of awareness and adoption rates of improved banana varieties in Delta state, Nigeria. Majority of the farmers (96.67%) were aware of and had access to improved banana varieties; 3.33% were not aware of the existence of improved varieties. However in spite of the high level of awareness and farmers access to improved planting materials, only 15.83% of them adopted the use of improved planting materials. The implication of this finding is that although majority of the farmers were aware of the existence of improve varieties, very few of them were adopters.

**Types of Planting Materials Used by farmers**

Majority of the farmers still preferred the local cultivars to the improved ones as 99% of the farmers used local cultivars while 1% of them used various types of improved varieties.

**Sources of improved planting materials adopted by farmers**

The result in Table 4 indicates that the major sources of improved planting materials are the Agricultural Development Programme (ADP), International Institute of Tropical Agriculture (IITA), Ibadan, Agricultural Research Institutes' farms and other farmers.

**Factors Affecting Farmers' Adoption of Improved Varieties**

Table 5 shows respondents' perceived constraints to the adoption of improved banana varieties. Respondents agreed that cost of obtaining planting material ($\bar{X}$= 4.80) was the most serious militating against their adoption of improved varieties. Climatic factors (X = 4.78), biological factors (X =4.60) Palatability of the local cultivars over improved ones (X= 4.59), poor soil conditions (X =4.46) and socio-economic characteristics of the farmers(X = 4.11) were also regarded as other serious constraints. Faced with these constraints, farmers in the area would less likely adopt improved banana varieties.

**Relationship between some selected socio-economic characteristics of respondents and adoption level of improved banana varieties**

The relationship between the socio-economic characteristics of the small-scale banana farmers and their adoption of improved cocoa banana varieties is presented in Table 6. The dependent variable was adoption of farmers, while the independent variables included age, gender, marital status, educational level, farming experience, farm size and household size. The overall model is significant at 1 % according to the model chi-square (223.766). It means that the model with the explanatory variables is better at predicting the knowledge score of the respondents than a model without the explanatory variables. The model classifies 90.8% of the responses correctly which equally confirms its usefulness. The $R^2$ value (0.866) implies that the explanatory or independent variables jointly account for about 87% variation in the respondents' likelihood to adopt improved banana varieties.

The result of the logit regression reveals that four variables, namely, age, educational level, household size and farm size, have significant influence on the probability of the respondents adopting improved varieties. The co-efficient for age (-0.044) and household size (b = -0.251) were negative which mean that respondents with lower age and family size are more likely to adopt improved banana varieties. Rahman, *et al*. (2002) asserted that the adoption index of an innovation or practice may be either positively or negatively related to the household size depending on the nature of age structure and the amount of labour contributed among members. It is more likely that respondents with larger family size will be distracted from acquiring knowledge about improved practices because they will devote part of their useful time for family issues. The coefficients of educational level and farm size were positive. Njoku (1991) opined that formal education has a positive influence on adoption of new ideas.

**Conclusion and recommendation**

The level of awareness of improved varieties in the study area was very high, however, only very few farmers were adopting the use of improved planting materials. Therefore the adoption level of improved varieties in Delta state was very poor. The mainly preferred improved banana varieties were Cavendish, Gros Mitchel and Sweet banana Different constraints hindered the adoption of improved banana varieties in Delta state, Nigeria. Socio-economic variables also affect the adoption rates of the small scale banana farmers in the study area.

From the findings, the following recommendations were suggested:

1. To ensure full utilization of improved banana varieties, farmers should be sensitized to the benefits of using them for planting.

**2.** Since cost is a major constraint to the adoption process, improved planting materials should be made available to farmers at a very subsidized rate. If possible government can decide to distribute improved suckers to banana farmers free of charge.

3. To support adoption of improved varieties, famers should be enlightened on the understanding of the biology, agronomy and climatic requirements of banana production.

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## APPENDIX

**Table 1: Socio-economic characteristics of the respondents**

| Variable | Frequency (240) | Percentage (100) |
|---|---|---|
| **Gender** | | |
| Male | 194 | 73.71 |
| Female | 46 | 26.29 |
| **Age ( years)** | | |
| 20 and below | 8 | 3.33 |
| 21 – 30 | 17 | 7.08 |
| 31 – 40 | 55 | 22.92 |
| 41 -50 | 48 | 20.00 |
| 51 – 60 | 77 | 32.08 |
| 61 and Above | 35 | 14.58 |
| **Marital Status** | | |
| Never Married | 25 | 10.42 |
| Married | 160 | 66.67 |
| Divorced | 22 | 9.17 |
| Separated | 10 | 4.16 |
| Widow/widower | 23 | 9.58 |
| **Educational Level** | | |
| No formal | 12 | 5.00 |
| Primary | 67 | 27.92 |
| Secondary | 66 | 27.50 |
| Tertiary | 95 | 39.58 |
| **Farming Experience( year )** | | |
| Less than 5 | 32 | 13.33 |
| 6 – 10 | 68 | 28.33 |
| 11 – 15 | 82 | 28.01 |
| 16 and Above | 58 | 24.17 |
| **Farm Size ( Hectare )** | | |
| 1 and below | 162 | 67.50 |
| 1.1 – 2.0 | 40 | 16.67 |
| 2.1 – 3.0 | 19 | 7.92 |
| 3.1 – 4.0 | 10 | 4.17 |
| Above 4.0 | 9 | 3.75 |
| **Household Size ( Number )** | | |
| 5 and below | 40 | 25.14 |
| 6 – 10 | 168 | 61.71 |
| Above 10 | 32 | 13.14 |

Source: Survey data, 2014

**Table 2: Banana farmers' access to and adoption of improved planting materials**

| Responses | Access to/ awareness of improved planting materials | | Adoption of Improved planting materials | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| Yes | 232 | 96.67 | 38 | 15.83 |
| No | 8 | 3.33 | 202 | 84.17 |

Source: Survey data, 2014

***Table 3: Varieties of banana used by farmers**

| Variety used | Frequency | Percentage |
|---|---|---|
| Gros mitchel | 12 | 5.00 |
| Cavendish | 7 | 2.92 |
| Sweet banana | 9 | 3.75 |
| Mathioya | 4 | 1.67 |
| Kiriyanga East | 6 | 2.50 |
| Uganda green | 2 | 0.83 |
| Meru Central | 4 | 1.67 |
| Mitunguu | 4 | 1.67 |
| Local cultivars | 238 | 99.17 |
| Others | 8 | 3.33 |

Source: survey data, 2014 *some farmers used multiple varieties

***Table 4: Major sources of improved banana suckers**

| Variety used | Source | Frequency |
|---|---|---|
| Gros mitchel | ADP/ IITA/Other farmers | 12 |
| Cavendish | ADP/IITA/ Research farms | 7 |
| Sweet banana | IITA/ other farmers | 9 |
| Mathioya | Other farmers | 4 |
| Kiriyanga East | Research farms | 6 |
| Uganda green | Research farms/ IITA | 2 |
| Meru Central | Research farms/ other farmers | 4 |
| Mitunguu | Other farmers | 4 |
| Local cultivars | Other farmers | 238 |
| Others | Other farmers | 8 |

Source: survey data, 2014

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**Table 5: Respondents' Perceived Constraints to adoption of improved varieties**

| Constraints | Mean | SD | Rank |
|---|---|---|---|
| High cost of improved varieties | 4.80 | 0.77 | 1st |
| Climatic factors | 4.78 | 1.20 | 2nd |
| Biological factors | 4..60 | 0.94 | 3rd |
| Palatability of the local cultivars over improved ones | 4.59 | 0.73 | 4th |
| Poor soil conditions | 4.46 | 0.55 | 5th |
| Socioeconomic variables | 4.11 | 0.91 | 6th |

Source: Survey data, 2014

*Likert Scale: 1 = not very serious, 2 = not serious, 3 = undecided, 4 = serious, 5 = very serious*

**Table 6: Relationship between the respondents' socio-economic characteristic and level of adoption of improved banana varieties**

| Explanatory Variables | Co-efficient | t-value | Sig | Odd Ratio |
|---|---|---|---|---|
| Constant ($X_1$) | -0.588 | -0.342 | 0.821 | 0.500 |
| Age ($X_1$) | -0.044 | -6.787 | 0.031* | 0.873 |
| Gender ($X_2$) | -0.039 | -0.075 | 0.941 | 0.944 |
| Marital Status ($X_3$) | -0.177 | -0.336 | 0.736 | 0.769 |
| Educational level ($X_4$) | 0.122 | 9.034 | 0.003* | 0.891 |
| Farming Experience ($X_5$) | 0.488 | 1.489 | 0.113 | 1.699 |
| Farm Size ($X_6$) | 0.322 | 7.013 | 0.009* | 1.121 |
| Household Size ($X_7$) | -0.251 | -2.407 | 0.020* | 0.802 |
| Model chi-square ($X^2$) | 223.766 | | | |
| | * Significant at $P < 0.05$ | | | |
| | Nagelkerke $R^2$ | | | 87% |
| | Overall % Correct Classification | | | 90.8 |
| | Significant level | | | 0.00 |