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# Adoption of Improved Maize Varieties Among Farming Households In Osun State, Nigeria

**Baruwa, O. I.; R. Kassali*; and Aremu, F. J.**

*Department of Agricultural Economics, Obafemi Awolowo University, Ile Ife, Nigeria.*

**Corresponding author: kasskassali@yahoo.com*

***Abstract***

*This study examined the adoption of improved maize varieties among farming households in Osun State, Nigeria. Multistage sampling procedure was adopted to collect data from 100 farming households in Ife Central and Ilesha East Local Government Areas with the aid of structured questionnaire. Both descriptive and inferential methods were used to analyse the data. Logit model was used to determine the factors affecting adoption and the intensity of adoption of improved maize varieties. Results indicated that the major factors influencing the adoption of improved maize varieties in the study area include level of education of the farmers ($p<0.01$), farm size ($p< 0.05$), gestation period ($p< 0.05$), access to credit ($p < 0.01$) while farming experience ($p< 0.05$) determined the intensity of adoption of improved maize varieties in the study area. The study recommended that to increase maize production in Nigeria through adoption of improved maize varieties, credit should be made available to farming households and dissemination of research outputs should be targeted at the women maize farmers and not just men. Also, improved maize seeds with early maturing varieties should be disseminated to farmers.*

***Keywords**: Improved Technologies, Maize Varieties, Households, Logit, Nigeria*

## Introduction

Maize *(Zea mays* L.) is a cereal of the family graminae produced across the world. It is a highly yielding crop easy to process, readily digested with cost advantage when compared to other cereals (IITA, 2001). It is an important source of carbohydrate and if eaten in the immature state, provides useful quantities of Vitamins A and C (Kudi *et al.*, 2011). Iron and vitamin B are also present in maize (Faleye, 2013).

Maize is one of the most important staple foods in Nigeria. It plays an important role both in terms of food security and nutritional intake, and accounting for about 43% of calorie intake with a daily consumption quantity of 53.20g per capita (FAOSTAT, 2007). It is also used extensively as the main source of calories in animal feeding and feed formulation (Mignouna *et al.*, 2010). Apart from food and feed, maize is also useful as medicines and as raw materials in agro-industries (Abdulrahaman and Kolawole, 2006).

Rogers (1995) defines adoption as a decision to make full use of an innovation or new technology as the best opportunity available to the farmer. In view of the uncertainty about the outcome or otherwise profitability of such innovation, greater effort is required by the farmer so as to decide whether to use the innovation or not. According Rogers (1969) for a technology to be acceptable by a farmer two conditions must be fulfilled; he/she must go through an adoption process such as awareness, interest, evaluation, and trial and the innovation must be “economically

profitable, socially acceptable and technologically visible" and generally most farmers show different attitude towards the adoption of agricultural technologies with attendant effect on farm output and farmer's livelihoods (Ayinde *et al.*, 2010).
Seed is the key input in Agriculture and to a great extent yield and quality of crop depend on the quality of the seed used (Awotide *et al.*, 2012; Adenuga *et al.*, 2014). Improved crop varieties make farmers to cultivate several times within the planting season because of a relatively short growing period. The genetic potential of these seeds also ensures increase in quantity harvested, disease and pest resistance, and drought tolerance; and can compete favourably with weeds (Africa Rice Center, 2008). There can be drastic improvement in Nigerian agriculture if the available improved technologies are accepted and adopted by the farmers (Ibrahim *et al.*, 2012). This could be as a result of increase in numbers of adopters, expansion of area under cultivation or reliance on irrigation (Datt and Ravallion, 1996). Modern agricultural technologies and improved practices have keys in the realization of increased agricultural productivity and in raising the standard of living of the farming population (Adenuga *et al.*, 2014). However, low rates of adoption of improved agricultural production technologies have been reported to be a major reason for the inadequacy in Nigerian agricultural production. Efforts put in agricultural research may not yield the desired results if they are not put to use by the end users. Therefore identification of the factors influencing adoption of improved technologies is very vital. This will help in raising the productivity of the farmers, and thereby improve their livelihood. There have been few studies conducted to determine the rate of adoption of improved agricultural technologies in Nigeria (Adenuga *et al.*, 2014; Donstop *et al.*, 2011; Diagne *et al.*, 2009). In view of the above, this study was carried out to: (i) describe the socio economic characteristics of the farming households in the study area; (ii) examine the factors influencing the adoption of improved maize variety among farming households in the study area; (iii) determine the intensity of the adoption of improved maize varieties among farming households in the study area. The knowledge of this is necessary to assist the current and prospective maize farmers and agricultural policy makers in taking decisions and making recommendations that will enhance adoption of improved maize varieties among farming households in the study area.

## Materials and Method

### Study Area

The study area was Osun State, Nigeria. Osun State is located in South- Western Nigeria and lies within Latitude $7.0^{o}$ and $9^{o}$ N and Longitude $2.8^{o}$ and $6.8^{o}$. The State is one of the six States that make up the South West geo-political zone in the Southern-western part of Nigeria. It has interstate boundaries with Ondo State to the South-East, Kwara State to the North, Ekiti State to the North-East, Oyo State to the West and Ogun State to the South-West. The State covers an area of 9,251 square km and lies between 300 and 600m above the sea level with a largely gentle and

undulating landscape. It has a population of 3,423,536 with a population density of 379 people/sq.km (NPC, 2006). The predominant farming system in the area is shifting cultivation with mixed cropping and crop rotation using mostly traditional technologies. Crops cultivated include maize, yam, cassava, citrus, cocoyam, cocoa and vegetables. The State is one of the major maize hub in southwest Nigeria (Osun State Government, 2013).

**Sampling Technique and Data Collection**

A multistage sampling procedure was adopted to select the respondents. In the first stage, Ife- Ijesa zone of the State was purposively selected because of the intensity of maize production in the area. Second stage involved selection of Ife Central and Ilesa East Local Government Areas (LGAs). In the third stage, five villages were selected from each LGA and at the fourth stage, ten households were selected from each villages using simple random sampling technique at each sampling stage, making a total sample of 100 farmers for the study.

Primary data were collected using a pre-tested questionnaire on socioeconomic characteristics, physical quantities and prices of inputs and outputs.

**Analytical Techniques**

Statistical analyses were performed on the data collected. The statistical techniques that were employed include the descriptive statistics and the Logit models.

**The Logit Model**

This model was used in this study to model the factors influencing the adoption of improved maize variety as well as the intensity of adoption of improved maize varieties. The Logit model was introduced by Joseph Berkson in 1944. It is a type of probabilistic statistical classification model. It measures the relationship between a categorical dependent variable and one or more independent variables, which are usually (but not necessarily) continuous, by using probability scores as the predicted values of the dependent variable. The model is expressed below as used by Gujarati (1988); Faleye (2013).

$$\ln \frac{\{P(X)\}}{(1-\{P(X)\}} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \text{---}\beta_n X_n + \Sigma_I$$

Where,

$\beta_0$= intercept

$\beta_1 \ldots \beta_n$= estimated parameters

$X_{1\ldots n}$= set of independent variables

$X_1$ = Farm size (ha)

$X_2$ = Education (years)

$X_3$ = Extension contact (1 if yes, 0 otherwise)

$X_4$ =Farming experience (years)

$X_5$ = Family size (number of adults in the farming household)

$X_6$ = Access to credit (1 if yes, 0 otherwise)

$X_7$= Gestation period (years)
$\Sigma_i$ = Error term

**Results**

**Socio-economic characteristics of the respondents**
The results in Table 1 show hat majority of the farmers in the study area was male (74.0%) with age range of 41-50 years while about 40% were above 50 years. Most of the farmers (75.0%) were married and as much as 23% had no formal education. Seventy-eight percent (78.0%) had 6-20 years experience in maize farming and 65.0% had large household size which ranged from 6-10 members. Most of the farmers had less than 1 hectare of land for maize cultivation. This denotes the urgency of improved maize varieties and only 38% adopted improved maize varieties, denoting a problem of visibility, ignorance or perception of those improved varieties.

**Determinants of adoption of Improved Maize Varieties**
Table 2 presents the maximum likelihood estimates of the Logit regression equation for improved maize variety adoption decision model. The significant Chi-square value of 27.77 ($p<0.01$) indicates a significant estimation that the hypothesized variables globally influence the adoption of improved maize varieties among farming households. Of all the variables Farm size ($p<0.05$), level of education of maize farmers ($p<0.01$), gestation period ($p<0.05$) and access to credit ($p<0.10$) only significantly influenced the probability of adopting improved maize varieties. The level of education of the farmers and access to credit were positive while farm size and gestation period of the seed were negative.

**Determinants of the intensity of adoption of improved maize varieties**
Table 3 presents the determinants of the intensity of adoption of improved maize varieties through the farmer's awareness of the improved seed. Out of all the variables fit into the model, only farming experience ($p<0.05$) significantly influenced the probability of intensity of adoption of improved maize variety in the study area. The coefficient of farming experience was positively related and significant at 5 percent.

Table 1: Socio-Economic and Demographic Characteristics of Maize Farmers

| Characteristics | Frequency | Percentage (%) |
|---|---|---|
| Gender | | |
| Male | 74 | 74.0 |
| Female | 26 | 26.0 |
| Total | 100 | 100.0 |
| Age (years) | | |
| 21 – 30 | 05 | 05.0 |
| 31 – 40 | 13 | 13.0 |
| 41 – 50 | 42 | 42.0 |
| 51 – 60 | 24 | 24.0 |
| 61 – 70 | 10 | 10.0 |
| >70 | 06 | 06.0 |
| Total | 100 | 100 |
| Marital Status | | |
| Single | 12 | 12.0 |
| Married | 75 | 75.0 |
| Divorced | 08 | 08.0 |
| Widowed | 05 | 05.0 |
| Total | 100 | 100 |
| Level of Education | | |
| No formal Education | 23 | 23.0 |
| Quranic Education | 26 | 26.0 |
| Primary | 36 | 36.0 |
| Secondary Education | 11 | 11.0 |
| Tertiary Education | 04 | 04.0 |
| Total | 100 | 100 |
| Farming Experience (years) | | |
| 1 – 5 | 10 | 10. |
| 6 – 10 | 31 | 31.0 |
| 11 – 15 | 29 | 29.0 |
| 16 – 20 | 18 | 18.0 |
| 21 – 25 | 07 | 07.0 |
| >25 | 05 | 05.0 |
| Total | 100 | 100.0 |
| Household size | | |
| 1 – 5 | 29 | 29.0 |
| 6 – 10 | 65 | 65.0 |
| 11 – 15 | 04 | 04.0 |
| > 15 | 02 | 02.0 |
| Total | 100 | 100.0 |
| Farm size (ha) | | |
| Less than 1 | 63 | 63.0 |
| 1-5 | 18 | 18.0 |
| 6-10 | 11 | 11.0 |
| 11-15 | 07 | 07.0 |
| > 15 | 01 | 01.0 |
| Total | 100 | 100.0 |
| Adoption of improved maize varieties | | |
| Yes | 38 | 38.0 |
| No | 62 | 62.0 |
| Total | 100 | 100.0 |

Source: Field Survey, 2013

Table 2: Determinants of Adoption of Improved Maize Varieties

| Variables | Coefficients | Standard Error | t-value |
|---|---|---|---|
| Constant | -6.192 | 3.136 | 0.048 |
| Age | 0.0204 | 0.0515 | 0.396 |
| Sex | 0.4785 | 0.7902 | 0.6055 |
| Household Size | 0.1077 | 0.2135 | 0.5044 |
| Education level | 0.3027*** | 0.0945 | 3.203 |
| Farming Experience | 0.0780 | 0.0562 | 1.387 |
| Farm size | -0.0274** | 0.0134 | -2.044 |
| Gestation period | -0.065** | 0.0299 | -2.173 |
| Extension contact | -0.2851 | 0.6883 | -0.196 |
| Access to credit | 1.0836* | 0.6366 | 1.702 |
| Technology | -0.42788 | 0.7349 | -0.582 |

Log likelihood function = -34.114***; Restricted log likelihood = -13.45***; Chi-square = 27.77***;P = 0.16x10-3; N=100; DF= 90; *** Significant at 1%, ** Significant at 5%; * Significant at 10%
Source: Field Survey, 2013

Table 3: Logit estimate of the intensity of adoption of improved maize varieties

| Variables | Coefficients | Standard Error | t-value |
|---|---|---|---|
| Constant | 0.644 | 0.780 | 0.523 |
| Age | -0.01483 | 0.014 | -1.059 |
| Sex | 0.0997 | 0.122 | 0.817 |
| Household Size | 0.9447 | 2.525 | 0.374 |
| Education level | 0.0357 | 0.123 | 0.290 |
| Farming Experience | 0.3572** | 0.180 | 1.981 |
| Farm size | 0.0252 | 0.101 | 0.249 |
| Gestation period | -0.0450 | 0.172 | -0.261 |
| Extension contact | -0.0036 | 0.201 | -0.017 |
| Access to credit | 0.3636 | 3.055 | 0.119 |
| Technology | 0.0580 | 0.0903 | 0.642 |

Log likelihood function = -13.51***; Restricted log likelihood = -12.52***; Chi-square =10.23***; P = 0.11 x 10-2; N=100; DF= 90; ** Significant at 5%;
Source: Field Survey, 2013

**Discussion**

The proportion of males among the farming indicates that there is large gender disparity in maize farming in the study area. This agrees with Adenuga *et al.* (2014) that maize farming in the tropics is dominated by male gender due to the peculiarity of farming system mostly used. Similarly, the low participation of women may be due to the traditional roles of gender as males are known to involve in energy sapping tasks compared to females in the study area. The age group of the farming households is an indication that maize farmers in the study area are getting old and

this may pose serious threat to food security in the study area in the future. The low level of formal education of the farmers might contribute to the low level of adoption of improved technologies. This result confirms with Diagne *et al.* (2009) who stated that adoption of improved agricultural production technologies is faster among educated farmers compared to the uneducated. The farmers (78.0%) are well experienced in maize farming with between 6-20 years maize farming experience. This can be an advantage for them to make up for their low educational status. The large household size of the farming household may be due to the practice of polygamy in the study area while the low hectare of land used for maize cultivation may be due to the problem of land fragmentation commonly encountered by farmers in the study area. These findings therefore are in line with Adenuga *et al.* (2014) who declared that the practice of polygamy among farming households is one of the reasons for large household size while the existence of land tenure system in Nigeria has drastically reduced the available land in Nigeria for mechanized agriculture.

The result of Logit model for the determinants of the adoption of improved maize varieties implied that a unit increase in the level of education of the farmers and their access to credit will increase the likelihood of adopting improved maize varieties by 30% and 108% while a unit increase in the farm size and gestation period of the seed will decrease the likelihood of adoption of improved maize varieties by 2.7% and 0.65% respectively. This confirms Adekoya *et al.*(2014) and Omonona *et al.* (2006). Other variables such as age, sex, family size, extension contact and technology were not significant factors in adoption of improved maize varieties in the study area.

The intensity of adoption of improved maize varieties by the farming households was only influenced by their farming experience. This therefore implies that farmers with longer years of farming experience tend to have a quick and better awareness of the improved maize seed than their inexperience counterparts. Hence, a unit increase in farmers experience will lead to 1.8% increase in the intensity of adoption of improved maize varieties in the study area. This result agrees with the findings of Idrisa *et al.* (2012) that experienced farmers are likely to adopt new agricultural production technologies because of better skills and information on how to manage the risks associated with improved technology.

**Conclusion and Recommendations**

This study has shown that farm size, level of education and gestation period are the major factors influencing the adoption of improved maize varieties while level of farming experience influence the intensity of the adoption in the study area. The study therefore recommends that farmers should be encouraged to attend adult education. This is because it is easier for educated farmers to accept modern agricultural technologies, especially production technology such as improved maize varieties. It is also important to broaden their understanding about the benefits associated with improved maize varieties. Also, the results of the study suggests that

farm size available to maize farmers should be increased through lease by the Government or other organizations in order to encourage large scale production and better adoption of the improved maize seed. Larger farm size can also lead to increase in the availability of improved seeds for other farmers. Early maturing maize varieties and credit should be made available to farmers. Extension services should be encouraged in order to disseminate adequate information about improved maize seeds to the farmers with years of farming experience.

**References**

Abdulrahaman, A.A., Kolawole, O.M. (2006).Traditional Preparations and Uses of Maize in Nigeria . *Ethnobotanical Leaflets 10:219-227.*

Awotide B.A, Diagne A. and Omonoma B. T. (2012). Impact of Improved Agricultural TechnologyAdoption on sustainable rice productivity and rural farmers' welfare in Nigeria: A local average treatment effect (LATE) Technique, Paper presented at the African Economic Conference, Kigali, Rwanda, 23pp.

Ayinde, O.E.; Adewumi, M.O; Olatunji, G.B. and Babalola, O. A (2010). Determinants of Adoption of Downy Mildew Resistant Maize by Small-Scale Farmers in Kwara State, Nigeria. Global Journal of Science Frontier Research. 10(1-1.0):32-35.

Adenuga, A.H., Omotesho, O.A., Ojehomon, V.E. T. and Diagne, A. (2014). Determinants of adoption of improved rice varieties in selected local government areas in Nasarawa State, Nigeria. *Ife Journal of Agriculture*27, 25-34.

Africa Rice Center (WARDA)/FAO/SAA (2008). NERICA: the new rice for Africa-a Compendium. Somado, E.A., Guei, R.G. & Keya, S.O. (eds.) Cotonou, Benin: Africa Rice Center (WARDA); Rome, Italy; Tokyo, Japan: Sasakawa Africa Association. 210pp. Retrieved from: http://www.africanrice.org/publications/nerica-comp/Nerica%20Compendium.pdf

Datt, G. and Ravallion, M. (1996) How important to india's poor is the sectoral composition of growth? *World Bank Economic Review* 10: 1, 1-26

Diagne, A., Adekambi, S.A., Simtowe, F.P and Biaou, D.G. (2009). The impact of agricultural technology adoption on poverty: The case of Nerica rice varieties in Benin. A shorter version of the paper is being presented as contributed paper at the 27th Conference of the International Association of Agricultural Economists, Beijing, China.

Donstop–Nguezet, P.M., A Diagne, A., Okoruwa, V.O.and Ojehomon, V.E.T. (2011). Impact of improved rice technology adoption (NERICA varieties) on income and poverty among Rice Farming households in Nigeria: A local

Average Treatment Effect (LATE) Approach. *Quarterly Journal of International Agriculture.* 50(3): 267-291.

FAOSTAT (2007) www.fao.org Accessed, 3rd April, 2013.

Faleye, A.E. (2013). Adoption of improved maize variety among farmers in Osun state, Nigeria. Unpublished Thesis. Department of Agricultural Economics, Obafemi Awolowo University, Ile Ife, Nigeria. Pp 25.

Gujarati, D.N. (1988).*Basic Econometrics* New York: McGraw-Hill.

Ibrahim, A.A., Mustapha, S.B. and Nuhu, S.H. (2012). Effects of adoption of rice production technologies on farmers' income in Borno State, Nigeria *Journal of Agriculture and Veterinary Science* 1(4):19-22.

Idrisa, Y.L., Ogunbameru, B.O. and Madukwe, M.C. (2012). Logit and Tobit analyses of the determinants of likelihood of adoption and extent of adoption of improved soybean seed in Borno State, Nigeria. *Greener Journal of Agricultural Sciences* 2(2):37-45.

Kudi, T. M., Bolaji, M., Akinola, M. O.and Nasa'I, D. H. (2011). Analysis of adoption of improved maize varieties among farmers in Kwara State, Nigeria. International Journal of Peace and Development Studies, 1:(3) 8-12.

IITA (2001). International Institute of Tropical Agriculture, Ibadan, Oyo State. Annual Report on Maize Production.

Mignouna, D.B., Mutabazi, K., Senkondo, E.M., and Manyong, V.M. (2010). Adoption of a New Maize and Production Efficiency in Western Kenya. Department of Agricultural Economics and Agribusiness, Sokoine University of Agriculture(SUA), Morogoro, Tanzania.

Nigerian Population Commission (2006).www.npc.com. Retrieved 3rd April, 2013.

Osun State Government of Nigeria (2013).http://en.wikipedia.org/wiki/Osun_State. Retrieved 24th July, 2013.

Rogers, E.M. (1995).*Diffusion of innovations* (4th edition.). New York. The Free Press. 519pp.