



## **ADOPTION OF IMPROVED MAIZE VARIETIES AMONG FARMERS IN BASSA LOCAL GOVERNMENT AREA OF PLATEAU STATE, NIGERIA**

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### **ABSTRACT**

This study examined the adoption of improved maize varieties in Bassa Local Government Area of Plateau State, Nigeria. Multistage –stage technique was used to collect data from a sample of 74 farmers. Descriptive Statistics, Adoption Index and Logit regression Model were used to analyze the data. The results showed that the mean age and farming experience of the respondent were 40 and 16.4 years respectively. It was revealed that local maize variety had a higher coefficient than the improved variety. The logit model showed that five of the variables were significant which include age, extension agents, fertilizer, cooperative membership and output. The study recommends that government and non-governmental organizations should encourage increase of extension agents and membership in cooperative societies. Also agricultural inputs should be provided at the right time to the farmers at a subsidized rate.

**Keywords: Improved Maize, farmers, Adoption, Logit model, Nigeria**

### **INTRODUCTION**

Maize is a staple food of great economic importance in the sub-Saharan Africa of which Nigeria is inclusive. In Nigeria, it is the third most important cereal crop after sorghum and millet (Ojo, 2000). The total land area planted to maize in Nigeria is above 2.5million hectares with an estimated yield of about 1.4 metric tonnes per hectare. Though, maize production is still very low especially when considered in relation to the growing feed needs of the country. About 20% of the global maize harvested is consumed directly as food and the remaining 80% is processed for secondary uses. Growth in maize utilization has been driven by the rapidly increasing demand for maize as livestock feed and industrial food and non-food products. Direct food uses of maize tend to decline as per capital income, milk, meat and egg consumption increase. The population of Nigeria is expected to grow at a rate of more than 3% per year, while food production is likely to grow at a rate of 2% or less a year. Closing this gap and increasing food production will require intensive agriculture based on use of modern technologies such as the use of improved seed varieties (FAO STAT, 2005).

Despite the economic importance of maize to the teeming populace in Nigeria, its production is insufficient to meet food and industrial needs of the country. This could be attributed to low productivity from maize farms due to non-adoption of improved technologies for maize production by farmers. Maize production in Nigeria has not been sufficient enough to meet the needs of people and livestock. Supply has not been able to meet demand despite the introduction of improved packages (Babatunde *et al.*, 2008). This study therefore aims at determining factor that influences the adoption of improved maize varieties by farmers in the study area. The specific objectives are to:

- i. describe the socio-economic characteristics of maize farmers in the study area.
- ii. determine the factors that influence the rate of adoption of improved maize varieties in the study area.
- iii. estimate the level of adoption of improved maize variety in the study area.

### Conceptual Framework/Literature Review

Maize is an important food and feed crop in Nigeria and remains an important crop for rural food security. The production of the crop must be increased in order to ensure food and income security through the development of improved maize varieties and technologies. Maize is a staple food of great socio economic importance in developing countries and it has a wide range of uses these include; baking, brewing industries and livestock feed. It is an important source of carbohydrates, protein, iron, vitamin B and minerals. Green maize (Fresh on the cob) is eaten parched, baked, roasted or boiled, playing an important role in filling the hunger gap after the dry season and serving as a staple diet for 200 million people (Directorate Agricultural Information services in cooperation with ARC- Grain Crop Institute, 2003). According to FAO data, the area in which maize was planted in West and central Africa alone increased from 3.2 million hectares to 8.9 million hectares in 2005. This phenomena expansion of the land area devoted to maize resulted in increased in production from 2.4 million metric tones to 10.6 million metric tones in 2005. In Nigeria between 2005 and 2007, the quantity of maize produced ranged from 5,567,000 tonnes to 7,800,000 tonnes (FAO, 2008).

Empirical evidence reveals that age, household size, education and varietal attributes were the most important factors that influenced the adoption of improved maize seeds, (Saka *et al*, 2005). Various studies on the factors affecting the adoption of agricultural innovations in developing countries have been conducted (Asfaw and Admassie, 2004). Ouma *et al*, (2006) suggested that the use of improved technologies would continue to be critical input for improved farm productivity. Obwona, (2000) and Ajibefun, (2006) found that the impact of socio-economic characteristics of farmers on adoption of recommended technologies was enormous. Ajibefun, (2006) include government policies such as credit accessibility by farmers and accessibility to markets which all affects the adoption of improved technologies. According to Idrisa *et al*, (2012) and Shiyani *et al*, (2002), socio-economic factors like farm size, farming experience have significant impact on the adoption of improved technologies. In their findings, they reported that small farmers, in comparison to large farmers, adopt improved technologies at a faster rate if additional gains are substantial. This is likely due to two reasons: First, small farmers live at subsistence level that attracts them to adopt an improved variety which gives better yields, earn more income and thereby helping in raising their standard of living. Secondly limited availability of improved seeds might have compelled large farmers to partly continue producing alternative crops. Also (Ouma *et al*., 2006; Omolehin *et al*., 2007) found that most farmers fear trying improved technologies because they do not have the necessary financial resources to adopt the technologies.

### METHODOLOGY

**Study Area:** The study was conducted in Bassa Local Government Area (LGA) of Plateau State, in northern Nigeria. Bassa LGA is one of the seventeen local government areas in the State. The area has a total population of 181,116 estimated from 2006 census and an average temperature of 18<sup>0</sup>C-27<sup>0</sup>C with annual rainfall 1317.5mm to 15000mm range per annum. It has an area of 1,743km<sup>2</sup>, bordering Kaduna and Bauchi State (Wikipedia, 2009). The people engaged majorly in farming activities and petty trading. The major food crop cultivated are rice, maize, hungry rice (acha), guinea corn, soya-beans. Major livestock includes cattle's sheep, goat and poultry.

**Method of Data Collection:** The data for the study were obtained mainly from primary source through the use of structured questionnaires designed in line with the objectives of the study.

**Sampling Technique:** Random sampling technique was employed to select respondents for the study. The study area comprises three (3) chiefdoms which include, Iregwe, Rukuba and Jere/Pangana. Six maize producing districts were purposively selected from the nine districts in the LGA (two districts from each chiefdom). Proportionate number of respondents were selected out of the total population of maize farmers in each of the six (6) districts earlier selected. This was done by selecting 10% each, of the total population of the maize farmers in Iregwe and Rukuba and 15% from Jere chiefdom. Ninety-one respondents were sampled across the three (3) chiefdoms; however, only seventy-four questionnaires schedules were retrieved.

**Method of Data Analysis:** Simple descriptive statistics such as frequencies and percentages were used to describe the socio-economic characteristic of the farmers in the study area. Adoption index were estimated for each of the maize variety grown in the area and consequently for local and improve maize varieties in the area. Logit regression model was used to determine the factors that influence the adoption of improved maize variety in the study area.

**Specification of Model**

The logit regression model was used to determine the factors that influence the adoption of improved maize variety in the study area.

Theoretically, the logit model is expressed as

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n$$

Where Y = Likelihood of Adoption

$\beta_0$  = Intercept

$\beta_1 \dots \dots n$  = estimated parameters

$X_1 \dots \dots n$  = set of independent variables

- $X_1$  = Age (years)
- $X_2$  = Gender (male 1, female 0)
- $X_3$  = Year of Education (number of years spent in school)
- $X_4$  = Household size (number of persons in the household)
- $X_5$  = Farming experience (years)
- $X_6$  = Co-operative membership (if yes 1, 0 if no)
- $X_7$  = Seed source
- $X_8$  = Extension contact (number of visit)
- $X_9$  = Access to credit (if yes 1, 0 if no)
- $X_{10}$  = Yield (N/Kg)
- $X_{11}$  = Fertilizer (Kg)

**Adoption Index**

To estimate the level of adoption, Adoption index were estimated for each of the maize variety grown in the area and consequently for local and improve maize varieties in the area. Adoption index was computed for individual famers where by adoption index (Br) is given by.

$$Bv = \frac{\sum_{i=1}^n Ri}{\sum_{i=1}^n RT}$$

Where:

- $\beta v$  = The adoption rate of maize variety v
- V = Maize variety
- Ri = Land area grown to maize variety v by farmer 1 (hectare)
- RT = Total land area grown to maize farm (hectare)
- I = (1.....n)

**RESULT AND DISCUSSIONS**

**Socio-Economic Characteristics of the Respondents**

In Table 1a, it shows the age distribution of the respondents. It revealed that majority (60.8%) of the respondents were young and energetic with a mean age value of 40 years. The males (74.32%) were found to be the ones cultivating the farm. This can be attributed to the fact that male farmers have more access to land acquisition. The marital status of the respondents shows that majority were married (74.22%). The level of education of the respondents reveals that more than half of them were literates. The mean of the household size was 5.4 persons. Also, the respondents farming experience mean were

16.4 years. The results also reveal that majority of the respondents acquired their land through inheritance (78.38%). The mean of the farm size of the respondents were 3.6ha. Majority of the respondents (81.08%) were not members of any cooperative society. Also, 72.97% of the respondents had no access to extension agents.

**Table 1a: Socio-Economic Characteristics of the Respondents**

	Frequency	Percentage
<b>Age</b>		
Less than 30	23	31.08
31 - 40	22	29.73
41 - 50	16	21.62
51 - 60	12	16.22
Above 60	1	1.35
Mean	40	
<b>Gender</b>		
Male	55	74.32
Female	19	25.68
<b>Marital Status</b>		
Single	18	24.32
Married	55	75.32
Widow	1	1.35
<b>Educational Status</b>		
Primary	18	24.32
Secondary	30	40.54
Tertiary	12	16.22
No Formal Education	14	18.92
Mean	12	
<b>Household size</b>		
1 – 3	17	22.97
4 – 6	36	48.64
7 – 9	15	20.27
Above 9	6	8.11
Mean	5.4	

Source: Field Survey,2014

**Table 1b: Socio-Economic Characteristics of the Respondents (continued)**

	Frequency	Percentage
<b>Farming Experience</b>		
Less than 10 years	27	36.49
11 – 20	31	41.89
21 – 30	7	9.46
31 – 40	7	9.46
Above 40	2	2.7
Mean	16.4	
<b>Farm size</b>		
< 1 hectare	1	1.35
1-3ha	45	60.81
3-5ha	14	18.92
Above 5ha	14	18.92
Mean	3.6	
<b>Cooperative membership</b>		
Yes	14	18.92
No	60	81.08
<b>Extension agent</b>		
Yes	20	27.03
No	54	72.97

Source: Field Survey, 2014

### Adoption Index

The estimated level of adoption of the various maize varieties by the farmers is shown in the Table 2.

**Table 2: Level of Adoption of the Respondents**

Maize variety	Total Land Area	Adoption Coefficient
Local		
DMESR	41.25	0.2581
ACR99772-L	12.00	0.0751
TZMSR	17.50	0.1095
TZMESR	10.50	0.0657
<b>Total</b>	<b>81.25</b>	<b>0.5084</b>
Improved		
Swam 1	41.25	0.2581
Sammaz	12.80	0.0801
Sammaz	7.00	0.0438
Sammaz	1.00	0.0063
Oba Supper 1	8.00	0.0501
Oba Supper 2	4.50	0.0282
TZPBSRC	4.00	0.0250
<b>Total</b>	<b>78.55</b>	<b>0.4916</b>

Source: Field Survey, 2014

The results from the table revealed that a larger proportion of land area grown to maize was cultivated with local maize varieties with an adoption rate of 51% while the adoption coefficient of improved maize varieties was estimated as 49%. From the result, the DMESR, local variety is commonly grown by the farmers while Swam 1 improved variety is commonly grown by the farmers in other of importance. This finding is in contradiction with the adoption improved rice varieties amongst small- holder farmers in South West Nigeria, which reported a higher adoption rate of the improved varieties (Saka, *et al*, 2005).

### **Factors Influencing the Adoption of Maize Farmers**

The result of the logit analysis in Table 3 shows the factors that influence the adoption of improved maize varieties. This revealed that five variables were significant, these include age, contact with extension agent, fertilizer usage, yield and cooperative society membership.

**Age:** The result reveals that age of the farmers were significant at 1% probability level with positive coefficient. This implies that there is a positive relationship between age of a farmer and adoption of improved maize varieties. This means that increase in age would give rise to an increase in likelihood of adoption. This finding is in line with the study of the determinants of the adoption of improved maize in Cameroon, reported by Etoundi and Dia (2008). They reported positive and significant relationship between age group and improved maize varieties. Simtowe *et al*, (2007) in a study on the impact of credit constraints on the adoption of hybrid maize variety in Malawi reported that young people are associated with a higher risk-taking behavior than the elderly which tend to stick to the their old production techniques and are usually less willing to accept changes.

**Contact with extension agent:** The study revealed that the coefficient of contact with extension agent was negative and significant at 1% probability level. It implies an inverse relationship between contact with extension agent and adoption rate. This means that, the decrease in extension contact might be responsible for farmer's non adoption. This finding contradicts that of Onu (2006) in the study of the socio-economic factors influencing farmer's adoption of alley farming technology under intensified agriculture in Imo State, Nigeria that reported positive coefficient between the factors influencing farmer's adoption and contact with extension agent.

**Fertilizer:** The result revealed that fertilizer was significant at 1% probability level with the negative coefficient. This implies that there is a negative relationship between fertilizer usage and likelihood of adoption. This means that increase fertilizer usage decreases farmers' decision to adopt improved maize varieties. This finding contradicts that of Amaza *et al*, (2007) in the study of farmer's perception, profitability and factors influencing the adoption of improved maize varieties in the Guinea Savannah of Nigeria.

**Yield:** The result revealed that yield was found to be significant at 1% probability level with positive coefficient. Yield is a primary measure of seed performance (Shiyan *et al*, 2002; Kristjanson *et al*, 2005). Crop varieties that have capacity to high yield stands a better chance of being adopted. The result implies that output has a direct relationship with adoption of improved maize varieties. An increase in yield increases the likelihood of adoption. This finding agrees with the results of (Idrisa *et al*, 2012) in the study of determinants of likelihood of adoption and extent of adoption of improved soya beans seed in Borno State.

**Cooperative membership:** Membership in a cooperative society was significant at 5% level of probability with a positive coefficient. This indicates that adoption of improved maize varieties increases with increased association of farmers in a cooperative society. This creates an avenue for awareness of improved agricultural technologies and also provides access to credit, creating adequate capital for farmers to procure inputs such as fertilizer, improved seeds, herbicides, pesticides and payment for labor required for adoption. This finding agrees with the results of Amaza *et al*, (2007) in the study of farmer's perception, profitability and factors influencing the adoption of improved maize varieties in the Guinea Savannah of Nigeria.

**Table 3: Logit Estimates of Factors that Influence the Adoption of Improved Maize Varieties in the Study Area.**

Variable	Coefficient	Standard Error	T – ratio
Age	1.938	0.298	6.505*
Education	- 0.033	0.052	- 0.632
Farming experience	0.025	0.040	0.062
Contact with extension agent	- 1.053	0.105	- 3.451*
Fertilizer	- 0.064	0.026	- 3.132*
Household size	- 0.079	0.108	- 0.732
Yield	0.882	0.207	4.260*
Co-operative membership	1.917	0.828	2.315**
Log likelihood function = -45.38571			
Degrees of freedom = 7			

**Source: Field Survey, 2014**

\* = Significant at 1%

\*\* = Significant at 5%

### CONCLUSION AND RECOMMENDATIONS

In conclusion, this research revealed that maize farmers in the study area do not have access to extension agents, thus, reducing their awareness of the improved varieties which is responsible for a reduced rate of adoption. It was also discovered that most maize farmers in the study area were male and young in age; this was attributed to the tedious cultural practices involved in maize production. Finally, it was discovered that age was an important factor that increase adoption rate as the relationship was directly proportional. Cooperative society membership was also discovered as a significant factor that would influence farmers to adopt the improved maize varieties. It was revealed in this research that, majority of maize farmers were not members of any cooperative society. This had a great impact on the farmer's likelihood of adoption as cooperative societies serves as a medium and avenue for information and technology dissemination and also meets some financial needs of the farmers which would help them solve majority of the problems they encounter in adoption, such as, fertilizer and improved seed purchase.

Governmental and non-governmental organizations should participate in increasing extension services in the Local Government Area and farmers should be enlightened on the benefit to be derived in being members of cooperative association. Farmers should be encouraged to form cooperatives, as cooperative society is very important for farmers as this is a source for credit and other farm inputs. Also for the purpose of cheaper and quicker information dissemination on new improved technologies. Government should ensure that subsidized agricultural production inputs such as fertilizer, improved seeds and also mechanized farm implements reach the farmers at approved rate/prices (i.e. government should ensure little or no corruption in disbursement of subsidized production input).

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