Socio-Economic Determinants of the Adoption of Improved Maize Varieties by Farmers in Shongom Local Government Area of Gombe State

Onwuaroh, A.S.[1*], Tata, L.A.[2], Mohammed, S.Y.[3], Chiroma, A. I.[4]

Department of Agricultural Economics and Extension, Federal University of Kashere, Gombe, Nigeria
*Corresponding Author

Received:- 01 April 2021/ Revised:- 10 April 2021/ Accepted:- 18 April 2021/ Published: 30-04-2021

Abstract— *This study was designed to determine the socio-economic determinants of the adoption of improved maize varieties by farmers in Shongom Local Government Area of Gombe State, Nigeria. The study specifically described the socio-economic characteristics of maize farmers in Shongom LGA, determined the socio-economic factors influencing the adoption of maize varieties introduced to farmers and identified the constraints faced by farmers in the adoption of the maize varieties. Data were collected through structured questionnaire and focus group discussion and analyzed using descriptive and inferential statistics. The findings revealed that majority of the respondents were male (84.96%), the mean age of respondents involved in maize farming was 36 yearsand46.90% of maize farmers had secondary school education. Also, above average (61.36%) of the respondents were married and the mean household size of the respondents was 8. The binary logit regression output shows that education, years of farming experience and extension contacts had positive and significant relationship with adoption of improved maize varieties; education, years of farming experience and extension contacts were all significant at $P \leq 0.01$.Years of residence and credit received were significant but had negative coefficients; credit received was significant at $P \leq 0.01$ while years of residence was significant at $P \leq 0.05$. The most common constraints to adoption of maize were high cost of fertilizer (97.80%), inadequate credit (74.73%), weeds (57.14%), pest and diseases (41.76%) and late arrival of inputs (33.52%). It is recommended that the cost of education be reduced to the barest minimum so that farmers can afford to educate themselves and their children. Also, more emphases should be made by ADPs and other extension agencies on regular visits by their agents to farmers.*

Keywords— Adoption, Maize, Farmers, Improved variety.

I. INTRODUCTION

Maize is a major cereal and one of the most important food crops in Nigeria. Its genetic plasticity has made it the most widely cultivated crop in the country from the wet evergreen climate of the forest zone to the dry ecology of the Sudan savanna (Kamara *et al*., 2020). Over the years, maize has become an important crop, taking over acreages from traditional crops such as millet and sorghum. In 2018, about 10.2 million tons of maize was produced from 4.8 million hectares, making Nigeria the highest producer in Africa (FAO, 2018).

Soil fertility in the savannas has progressively declined due to increased pressure on land resources arising from rapid population expansion combined with low use of fertilizers. The soil is deficient both in macronutrients, such as N, P, and K, and key micronutrients, such as copper and zinc. Therefore, the soil cannot support meaningful maize yields without proper fertilization. Yields as low as less than 1 t ha-1 can be obtained without the addition of fertilizer (Kamara *et al*., 2020). Research efforts by plant breeders and agronomists have led to the production of many technologies including the breeding of high yielding varieties that are tolerant to drought, diseases, low nitrogen, and striga infestation (Kamara *et al*., 2014).

Maize being a major staple crop in Nigeria is of vital concern to agricultural policy decisions. FAO (2017) reported that Nigeria produced 10.5 Million metric tons of maize in the year 2017. Maize production in Nigeria for the 2019/20 season is estimate at about 10.5 Million metric tons (Foreign Agriculture Service (FAS) Lagos, 2019). Local maize farmers in Nigeria can raise yield to about 4.2 tonnes/ha and national production could hit 20 million tonnes (International Institute of Tropical Agriculture (IITA), 2009). The average yield of maize in Nigeria for the year 2019 was recorded to be 1.69 tonnes/ha (IITA, 2020). When compared to other African countries such as Egypt and Mauritius with average yields of 7.1 tonnes/ha and 5.8 tonnes/ha respectively, Nigerian maize farmers can be said to be producing far below expectation (Food Agriculture Organization Corporation Statistic Database, 2009). In Shongom LGA, maize farmers do not realize up to the expected average yield of 4.2 tonnes/ha despite the availability of new maize varieties and other improved agronomic practices, the reason for this anomaly is what the study sort to reveal. This study is motivated by the important position of maize production in the Nigerian economy. Maize production does not only serves as a major staple food to a majority of the citizens of Nigeria but also a good source of revenue to both farm households and the nation at large.

The study therefore assessed the socio-economic determinants of the adoption of improved maize varieties by farmers in Shongom Local Government Area of Gombe State, Nigeria. The study objectives were to: describe the socio-economic characteristics of maize farmers in Shongom LGA, determine the socio-economic factors influencing the adoption of maize varieties introduced to farmers and identify the constraints faced by farmers in the adoption of the maize varieties. The research hypothesis is:

H_0^1: Socio-economic factors of maize farmers have no significant influence on adoption of improved maize variety.

H_A^1: Socio-economic factors of maize farmers have significant influence on adoption of improved maize variety.

II. METHODOLOGY

2.1 The Study Area

The study was conducted in Shongom LGA of Gombe State. Gombe State is located in the northeastern part of Nigeria. The state covers an area of 20,265 km² and from the 2006 census has a population of about 2,365,000 people (National Population Commission, 2007). At 3.2% growth rate, the year 2020 projected population of the state is 3,585,104. Shongom LGA has its headquarters in the town of Boh in the north of the Area. The town of Shongom lies between Latitude 9^{o} 40^{I} 25^{II}N and Longitude 11^{o} 15^{I} 24^{II}E. The LGA covers an area of 922 km² and has a population of 151,520 (National Population Commission, 2007). At 3.2% growth rate, the year 2020 projected population of the LGA is 229,689. Shongom has an annual rainfall of 560 - 740 mm (July - October) and lies 300 - 400m above sea level (Anon, 1987). The area is bounded to the north by Akko LGA and to the west by Kaltungo LGA, the south is bound by Billiri LGA while, Karin-Lamido and Alkaleri LGA in both Taraba and Bauchi state forms the eastern boundaries of the local government area (Dede *et al.*, 2005). The area falls within the Sudan Guinea savannah, at the boundaries of the Sahel savannah belt; that separate the forest zone from the savannah areas. It has sparse vegetation and enjoys hot weather climate most part of the year (Shamaki *et al.*, 2009). The major spoken language is Tangale, other languages spoken are English and Hausa. Majority of the residents are mainly farmers, but during the dry season they involve in other activities as carpentry, welding, blacksmith etc. A total of seven villages in the LGA including Boh, Lapan, Lalaipido, Filiya, kulishen, Gwandom were selected for the purpose of this research.

Sample Size and Sampling Technique

Multi-stage sampling technique was employed in selecting the farmers for this study. In the first stage, out of all the Northeast States in Nigeria, Gombe was purposively selected because it was the first State in Northeast to witness the pilot trial of Agricultural Development Programmes (ADPs) in Nigeria. In the second stage, out of the 11 Local Government Areas(LGAs) in the State, Shongom LGA was purposively selected. The Local Government Area was selected because it has a high proportion of maize growers. In the third stage, a total of seven villages were purposively selected; these villages were selected based on the fact that high proportions of maize growers are found in them. In the fourth stage, simple random sampling technique was employed in selecting farmers from these villages to avoid being bias. Out of a sample frame of 2200 maize growers, 339 respondents were randomly selected as the sample size. See Table 1.

TABLE 1
POPULATION AND SAMPLE SIZE OF MAIZE FARMERS

State	LGA's	Villages	**Sample frame	Sample size
Gombe	Shongom	Lapan	400	62
		Boh	400	62
		Lalaipido	350	54
		Filiya	300	46
		Kushi	200	31
		Kulishin	300	46
		Gwandum	250	38
Total		**7**	**2200**	**339**

***Source: Gombe State Agricultural Development Programme*

Yamane (1967) formula was used to calculate the sample size with 95% confidence level and 5% sampling error assumption.

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Where,

n= Sample size (Total sample size)

N= Population size (Total sample frame)

e= Level of significance (set at 0.05 for this study)

To determine further the proportion of the respondents (sample size per village), Yamane (1967) sampling method for determining of respondents was used i.e:

$$\text{Sample size of village} = \frac{\text{Sample frame of village} \times \text{Total sample size of all villages}}{\text{Total sample frame of all villages}} \quad (2)$$

2.2 Data Type and Source

Primary data and secondary sources of information were used for this work. Primary data was achieved via structured questionnaires and focus group discussion while the internet, journals, textbooks, conference papers etc were used as secondary sources of information.

2.3 Tool of Analysis

In this study, the descriptive and inferential statistics was used to achieve the specific objectives. The descriptive statistics such as frequency count, table, percentage, range and mean are some of the mathematical tools were used and the Binary Logit Regression Model was used to determine the socio-economic factors influencing the adoption of improved maize varieties.

The empirical model is specified as follows:

$$Y = \ln\left(\frac{p}{1-p}\right) = \beta 0 + \beta 1X1i + \beta 2X2i + \beta 3X3i + \beta 4X4i + \beta 5X5i + \beta 6X6i + \beta 7X7i + \beta 8X8i + \beta 9X9i + + e \quad (3)$$

Where;

In = natural logarithm

P= probability

Y = practice of ADP services ($Y_= 1$ when "yes", $Y_= 0$ when "no")

β_0 = constant term

β_1- β_9 =regression coefficients

X_1 = age of farmer (years)

X_2 = household size (number)

X_3 = educational status (years)

X_4 = numbers of extension contact (number of extension contact/period)

X_5 = farm size (hectares)

X_6 = farming experience (years)

X_7=extension contact

X_8= credit

X_9= income of farmers

III. RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics

The results in Table 2 show that majority of the respondents were male (84.96%) while the rest were females (15.04%) This indicates that male dominated maize farming in the study area. This finding is in agreement to that of Idrisa *et al*. (2012) who worked on Influence of Farmers Socio-economic and Technology Characteristics on Soybean Seeds Technology Adoption in Southern Borno and revealed male respondents to be 87.7%. Also the Table reveals that the mean age of respondents involved in maize farming was 36 years. This shows that the farmers were young, in their active stage and expected to have more energy to practice maize farming. This result is similar to the findings of Olaniyi and Adewale (2010) and Jamilu *et al.* (2014) who found that maize farmers were between 30-35 years. Similar to this finding, Onyedicachi (2015) found a mean age of 40.79 among rural farming household in Abia State, Nigeria. The table further shows that 6.49% of respondents in the study area had no formal education, 0.59% attended adult education, 10.91% had primary education, 46.90% had secondary education, 19.17% had NCE/OND and 15.93% of the respondents had bachelor's degree education level. Majority (46.90%) of maize farmers having secondary school education shows that farmers in the study area possess the basic education to understand the implications of adopting new technologies which have been introduced to them by the (Agricultural Development Programmes (ADPs). This result contradicts the finding of Jamilu *et al*. (2014) who found low level of education among maize farmers but agrees with the studies by Okunlola and Akinwalere (2011) on adoption of new technologies by fish farmers and Ajewole (2010) on adoption of organic fertilizers which revealed that the level of education had a positive and significant influence on adoption of the technologies introduced to farmers. Higher education influences respondents' attitudes and thoughts, making them more open, rational and able to analyze the benefits of the new technology.

For marital status of the respondents, Table 2 further revealed that majority (61.36%) of the farmers were married; this implies that married people concentrate on maize farming probably to provide food for their family members. This finding is similar to that of Umar *et al.* (2014) who found that majority of the farmers were married. Also, 37.46 % were never married, 0.29% were divorced or separated and 0.88% were widowed.

The result also shows that the mean household size of the respondents was 8 with 82.89% of the respondents having a household size of 1-10, 15.63% of the respondents had 11-20 household size, 0.88% had a household size of 21-30 and 0.59% had household size of 31-40. Household size could be an important factor in the adoption of new practices in maize production considering the tasks involved in agronomic activities on the field such as method of planting and seemingly fertilizer application methods, weeding, harvest, processing, among others . It will therefore be easier for a relatively larger household size to adopt the technology and practices. This is in agreement with the report of Motuma *et al.* (2010) that increase in family size positively influences the decision to adopt improved maize varieties.

TABLE 2
SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS (n=339)

Variables	Frequency.	Percent	Mean
Sex			
Male	288	84.96	
Female	51	15.04	
Age			
11-20	19	5.60	
21-30	99	29.20	
31-40	117	34.51	36
41-50	74	21.83	
51-60	19	5.60	
Above 60	11	3.24	
Education			
No formal education	22	6.49	
Adult Education	2	0.59	
Primary Education	37	10.91	
Secondary Education	159	46.90	
NCE/OND	65	19.17	
University	54	15.93	
Marital Status			
Never Married	127	37.46	
Married	208	61.36	
Widowed	3	0.88	
Divorced	1	0.29	
Household Size			
1-10	281	82.89	
11-20	53	15.63	8
21-30	3	0.88	
31-40	2	0.59	

Source: Field Survey, 2020

Results from Table 3 revealed the mean cultivated land in the study area to be 2.9 with most farmers (77.88%) in the study area cultivating between 0.5-2.5ha of land. About 18% of the respondents cultivated farm sizes ranging from 2.6-4.6ha. Only 0.29% of the respondents cultivated farm sizes ranging from 15.2-17.2ha. of land. This confirms the report of the Nation Newspaper that few of the problems associated with maize farmers to a greater extent in Bauchi state are small farm size and low income earning (The Nation, 2009). This may be a result of problem of land tenure which ravaged the state in general. Also this implies that maize farming is dominated by small scale farmers. This finding corroborates that of Jamilu *et al*. (2014) who found that maize farmers operate on small scale.

The table further shows that 43.07% of respondents had 1-10 years of farming experience in the study area. About 32.50% of the respondents had 11-20 years of experience, 18.88% had 21-30 years of experience and only 0.58% had 51-70 years of farming experience. This indicated that most respondents had acquired some experience, knowledge and skills to varying degrees in farming. Experience, knowledge and skills increase with increase in years of farming. This finding is similar to that of Komolafe *et al*. (2014) who found high farming experience among farmers.

Table 3 also shows that 88.50% of the respondents have had 0-3 contacts with extension agents, 9.44% had 4-7 contacts with the agents, 1.47% of the respondents had 8-11 contacts and 0.59% of the respondents have had 12-15 contact with extension agents. It can therefore be deduced from the result that extension agents' services are lacking in the study area. According to Obinne (1991), the role of the extension agent in technological transfer is of great importance to the sustenance of viable technology. The result further indicated that 88.27% of the respondents received 0-20,000 naira worth of credit, 7.3% received 21,000-50,000 naira worth of credit, 3.23% received 51,000-100,000 naira worth of credit and only 0.29% received

152,000-200,000 naira worth of credit. This finding is supported by the study of Kudi *et al*. (2010) which revealed that inadequate capital was a major constraint to adoption of technology.

TABLE 3
SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS (n=339)

Variables	Frequency.	Percent	Mean
Size of Land Cultivated			
0.5-2.5	264	77.88	2.9
2.6-4.6	60	17.7	
4.7-6.7	10	2.95	
6.8-8.8	2	0.59	
13.1-15.1	2	0.59	
Years of Farming Experience			
01.-10	146	43.07	
11-20	110	32.45	
21-30	64	18.88	
31-40	13	3.83	
41-50	4	1.18	
51-60	1	0.29	
61-70	1	0.29	
Extension Contacts			
0-3	300	88.5	
4-7	32	9.44	
8-11	5	1.47	
12-15	2	0.59	
Credit Received			
0-20000	301	88.27	
21-50000	25	7.33	
51-100000	11	3.23	
101000-151000	3	0.88	
152000-200000	1	0.29	

Source: Field Survey, 2020

3.2 Socio-economic Determinants of Adoption of Improved Maize Varieties

The results of the logit regression output can be interpreted using log odds or odds ratio. For this work, the interpretation was done using odds ratio. Table 4 shows that education; years of farming experience and extension contacts were significant and positive while years of residence and credit received had a negative relationship with adoption of practices. The table further shows that education was significant at 1% and had odds ratio of 1.667, years of farming experience was significant at 1% with odds ratio of 3.218, extension contact was significant at 1% and had odds ratio of 3.291. This implies that every unit increase in education, years of farming experience and extension contacts will more likely increase the adoption rates by 66.7% 221% and 229.1% respectively. This result agrees with komolafe *et al*. (2014) who found that farmers with high level of education adopt new technologies easily and use them effectively while farmers with more years of farming experiences will be more efficient in farm production. Also the result is in line with previous studies from Lawal and Oluloye 2008 and Bamire *et al*., 2010 which showed that farmers' education and access to extension services exert positive and significant influence on adoption of improved maize varieties.

Furthermore, Table 4 revealed that year of residence was significant at 5% and had an odds ratio of 0.952 and credit received was significant at 1% with odd ratio of 0.165. This means every unit increase in years of residence and amount of credit received will make the adoption of improved maize varieties less likely by 4.8% and 83.5% respectively.

TABLE 4

SOCIO-ECONOMIC DETERMINANTS OF ADOPTION

Adoption of practices	Coefficient (odds ratio)	Standard Error	t-value	p-value	[95% Conf	Interval]	Sig
Sex	1.898	1.002	1.21	0.225	0.675	5.343	
Age	1.243	0.326	0.83	0.407	0.743	2.077	
Education	1.667	0.320	2.66	0.008	1.144	2.430	***
Marital	1.719	0.859	1.08	0.278	0.646	4.576	
Residence yrs.	0.952	0.019	-2.45	0.014	0.915	0.990	**
HH Size	1.513	0.552	1.13	0.257	0.740	3.095	
Farm Size cult.	1.143	0.313	0.49	0.625	0.668	1.956	
Farming exp.	3.218	0.795	4.73	0.000	1.982	5.224	***
Ext. contact	3.291	1.432	2.74	0.006	1.403	7.722	***
Credit received	0.165	0.100	-2.98	0.003	0.050	0.538	***
Constant	0.008	0.014	-2.76	0.006	0.000	0.245	***
Mean dependent var		0.566	SD dependent var			0.497	
Pseudo r-squared		0.254	Number of obs			182.000	
Chi-square		63.212	Prob> chi2			0.000	

Source: Field Survey, 2020

****** p<0.01, ** p<0.05, * p<0.1***

3.3 Testing of Hypothesis

The hypothesis 1 of the study which assumes that socio-economic factors of maize farmers have no significant influence on adoption of improved maize varieties was tested and the result in Table 5 shows that the value of F-calculated (6.51) was greater than F-critical value (2.43). This implies that the socio-economic factors influenced the adoption of practices introduced. The null hypothesis is therefore rejected and the alternative hypothesis accepted.

TABLE 5

ANALYSIS OF STUDY HYPOTHESIS

Hypothesis	F-Calculated	F-Tabulated (f-critical) at 1% significance level
Hypothesis 1	6.51	2.43

Source: Field Survey, 2020

3.4 Constraints by Farmers in the Adoption of Improved Maize Varieties in Shongom LGA

Table 6 shows that the most common constraints to adoption of practices were high cost of fertilizer (97.80%), inadequate credit (74.73%), weeds (57.14%), pest and diseases (41.76%) and late arrival of inputs (33.52%).This finding is supported by the study of Kudi *et al*. (2010) which found that major constraints to adoption was lack of adequate capitals and high cost of inputs. Umar *et al*. (2014) also found that unavailability of seed and high costs of fertilizer were the major constraint of maize production to maize farmers. The study is also in agreement with the study done by Makokha *et al*. 2001 on determinants of fertilizer and manure in maize production in Kiambu county Kenya, he reported high cost of labor and other inputs, unavailability of demanded packages and late arrival of inputs as the main constraints to fertilizer adoption.

TABLE 6

CONSTRAINTS BY FARMERS IN THE ADOPTION OF IMPROVED MAIZE VARIETIES (n=182)

Constraints	Frequency	Percent of response	Percent of cases
Late arrival of inputs	61	10.99	33.52
High cost of fertilizer	178	32.07	97.8
Weeds	104	18.74	57.14
Pests and diseases	76	13.69	41.76
Inadequate credit	136	24.5	74.73
Total	**555***	**100**	**304.95**

Source: Field Survey, 2020

****Multiple Responses***

IV. CONCLUSION AND RECOMMENDATION

The mean age of farmers in the study area was 36, this indicates that most people engaged in farming in the study area were still in their active stage and therefore have more energy to engage in maize production. Also, the mean household size was 8, this implies that they had adequate man power to carry out farm activities. Education, years of farming experience and number of extension contacts had positive and significant relationships with adoption of improved maize varieties. This implies that more formal education and visits by extension agents have the capacity to increase the adoption rates of technologies introduced to farmers. Some of the major constraints faced by farmers in adoption of the practices introduced were late arrival of inputs, high cost of fertilizer, weeds, pest and disease and inadequate credit. If these constraints are given proper consideration by appropriate bodies, maize production in the study area would be boosted.

Education and extension contacts were significant and positively influenced the adoption of practices introduced. It is recommended that the cost of education be reduced to the barest minimum so that farmers can afford to educate themselves and their children. Also, more emphases should be made by ADPs and other extension agencies on regular visits by their agents to farmers. One of the major constraints faced by farmers in the adoption of practiced introduced was high cost of fertilizer, therefore, proper monitoring and strengthening of the on-going fertilizer subsidy intervention in order to block leakages and ensure timely disbursement to farmers should be put in place.

REFERENCES

[1] Ajewole, O. C. (2010). Farmers' Response to Adoption of Commercially Available Organic Fertilizers in Oyo State, Nigeria. *African Journal of Agricultural Research* 5(18): 2497-2503.

[2] Anon, T. 1987. Tourist; Plateau printing and Publishing Company. Jos: 5–9.

[3] Bamire, A. S., Abdoulaye, T., Sanogo, D. and Langyintuo, A. (2010). Characterization of maize producing households in the Dry Savanna of Nigeria. CIMMY

[4] Dede, P.M., Dadah, A.J., Uzoigwe, N.R., Adesiyan, S.A., Omoogun, G.A. and Halid, I. (2005) Current status of tsetse in Yamaltu-Deba L.G.A., Gombe state Nigeria. *Nig. J. of Entomol*. 25-29

[5] Food and Agriculture Organization Corporate Statistical Database (**FAOSTAT**).(2009). The Food and Agricultural Organization of the United Nations Production Databases [Online], URL: http://www.fao.org.

[6] Food and Agriculture Organization Corporate Statistical Database (FAOSTAT) (2018). https://search.library.wisc.edu/catalog/999882363002121.

[7] Food and Agricultural Organization (FAO) (2017). Global Information and Early Warning System (GIEWS): Country briefs, Nigeria.
http://www.fao.org/giews/countrybrief/country.jsp?code=NGA. Accessed 28th March, 2021

[8] Foreign Agriculture Service (FAS) Lagos (2019). Grain and Feed Annual 2019.
https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Grain%20and%20Feed%20Annual_Lagos_Nigeria_5-6-2019.pdf. Accessed 28th March, 2021

[9] Idrisa, Y.L., Ogunbameru, B.O. and Amaza, P.S. (2010). Influence of Farmers Socio-economic and Technology Characteristics on Soybean Seeds Technology Adoption in Southern Borno State, Nigeria". Department of Agricultural Economics and Extension Services, University of Maiduguri, Maiduguri, Nigeria.

[10] International Institute of Tropical Agriculture (IITA) (2020). IITA-Business Incubation Platform (BIP) sets record for maize production per hectare in Nigeria. https://www.iita.org/news-item/iita-bip-sets-record-for-maize-production-per-hectare-in-nigeria/. Accessed 28th March, 2021

[11] International Institute of Tropical Agriculture (IITA). (2009). Annual Reportfor 2009/10

[12] Jamilu, A.A., Abdul-Aziz, H., Jafaru, A.K., Sani, B.M. and Abudu, S. (2014). Factors influencing the adoption of Sasakawa Global 2000 maize production technologies among small holder farmers in Kaduna State. *Journal of Agricultural Extension,*18(1): 73-83.

[13] Kamara, A.Y., Kamai, N., Omoigui, L.O., Togola, A., Ekeleme, F. and Onyibe, J.E. (2020). Guide to Maize Production in Northern Nigeria.
https://www.iita.org/wp-content/uploads/2020/07/Guide-to-Maize-Production-in-Northern-Nigeria.pdf. Accessed 10th, April, 2021

[14] Kamara, A.Y., S.U. Ewansiha, and A. Menkir. 2014. Assessment of nitrogen uptake and utilization in drought-tolerant and Striga resistant tropical maize varieties. Archives of Agronomy and Soil Science 60: 195–207. doi:10.1080/03650340.2013.783204

[15] Komolafe, S. E., Adeseji, G. B. andAjibola, B.O. (2014). Determinant of adoption of improved crop practices among women farmers in Ekiti East L.G.A. of Ekiti, Nigeria. *Journal of Agricultural Research*, 5(2):22-31.

[16] Kudi, T.M., Bolaji, M., Akinola, M.O. and Nasa, I.O.H. (2010). Analysis of adoption of improved maize varieties among farmers in Kwara State, Nigeria. *International Journal of Peace and Development Studies*, 1(3): 8-12.

[17] Lawal, J. O. and Oluyole, K. A. (2008). Factors influencing adoption of research results and agricultural technologies among cocoa farming households in Oyo State, Nigeria. *International Journal of Sustainable Crop Production*, 3(5), 10-12.

[18] Makokha, S.,Kimani, S., Mwangi, W., Verkuij, H. and Musembi, F. (2001) Determinants of Fertilizer and Manure Use for Maize Production in Kiambu District, Kenya. CIMMYT (International Maize and Wheat Improvement Center) Mexico.

[19] Motuma T., Dejene A., Wondwossen T., Roberto L. R, Girma, T., Wilfred M. and Germano M. (2010). Adoption and continued use of improved maize seeds: Case study of Central Ethiopia. *African Journal of Agricultural Research*, 5(17): 2350-2358.

[20] National Population Commission (2007).*Population and Development Review*. 33(1): 206-210.

[21] Obinne, C. P. (1991).Adoption of Improved Cassava Production Technologies by Small-Scale Farmers in Bendel State. Journal Agricultural Science and Technology14. Pp15

[22] Okunlola O, and Akinwalere, B. (2011). Adoption of new technologies by fish farmers in Akure, Ondo State. *Nigeria Journal of Agricultural Technology* 7(6): 1539-1548.

[23] Olaniyi, O.A. and Adewale, J.G. (2012).Information on maize production among rural youths.A solution for sustainable food security in Nigeria.

[24] Onyedicachi, A. C. (2015). The effect of social capital on access to micro credit among rural farming households in Abia State, Nigeria. Agrosearch15(1): 59 –75. Available @ Http://Dx.Doi.Org/10.4314/Agrosh.V15i1.4. Retrieved 7thMarch, 2016

[25] Shamaki, B.U., Obaloto, O.B., Kalejaiye, J.O., Lawani, F.A.G., Balak, G.G. and Charles, D. (2009). A wet season survey of animal trypanosomosis in Shongom local government area of Gombe state. Nigeria. *National Research Center for Protozoan Diseases*, 19: 1-6

[26] The Nation (2009).Boosting cowpea production in Bauchi. Published 11thSeptember, 2009.

[27] Umar, S., Musa, M.W. and Kamsang, L. (2014). Determinants of Adoption of Improved Maize Varieties among Resource-Poor Households in Kano and Katsina States, Nigeria. *Journal of Agricultural Extension Journal*, 18(2): 196-205

[28] Yamane, T.(1967). Statistics: *An Introductory Analysis, 2nd Ed*., New York: Harper and Row.