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Analysis of Utilization of Agricultural Innovation among Farmers in Southern Borno, Nigeria

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ABSTRACT

This study analyzed the utilization of improved maize production technology among farmers in southern Borno, Nigeria. The specific objectives were to examine the socio-economic characteristics of respondents in the study area and determine the relationship between the socio economic characteristics of the respondents and their utilization of agricultural innovation. Data for the study were obtained from 360 respondents selected through multi-stage sampling procedure. Both descriptive and inferential statistical techniques were used to analyze the data. Regression analysis (OLS) was used to establish relationship between socio-economic characteristics of the respondents and utilization of agricultural innovation. The study revealed that majority (79%) of the respondents were males and 69.9% had less than 8 persons per household. Level of education and gender were the most significantly ($P< 0.01$) important factors that influenced agricultural innovation utilization among farmers in the study area. Farm size, age of respondents, extension contact, radio ownership ($P< 0.01$) and cosmopoliteness ($P < 0.05$) were also observed as significant factors in influencing agricultural innovation utilization by farmers in the study area. Based on the findings of this study, it was recommended that research institutions and organizations related to agriculture such as IITA, PROSAB and BOSADP should intensify their research efforts in breaking new grounds for innovations to be disseminated by extension agents and radio broadcasts. Similarly farmers should be given more priority when it comes to improved technology dissemination to help raised their standards of living.

Keywords: Utilization, Socio-economic characteristics, Innovation, Improved maize seed

INTRODUCTION

Maize (Zea mays L.) is one of the food crops in the Savanna ecology of northern Nigeria. It is well adapted to the unimodal-modal rainfall pattern of 800mm-1200mm, which extends over a season of 120-130 days with drought commonly occurring earlier and sometimes late in the season (PROSAB, 2006). Fakorede *et al*. (1999) stated that maize yield is very low averaging 1.5 tonnes/ha in northern Nigeria. Maize currently accounts for approximately 20% of domestic food production in West and Central Africa, and one of the major cereal crops with between 30% and 40% of area under production in Nigeria (CIMMYT 1990; Kamara *et al.*, 2005).

According to Doss (2003; 2006), one way of improving agricultural production, in particular and rural livelihood in general is through the introduction of improved agricultural technologies to farmers. Idrisa (2009) reported that the utilization of improved technologies is an important means to increase the productivity of small holder farmers in Africa, thereby fostering economic growth and improved well being for millions of the poor households. Low utilization of improved agricultural technologies that can increase farmers' productivity is generally known to lead to reduced agricultural output.

Earlier studies by (Seyoum, *et al*. 1998, Obwona, 2000; Ajibefun, 2006) indicated that the low rate of utilization of agricultural innovation/technologies could be due to low expected benefits from the practice or to other factors such as farmers' characteristics or technology factors which may not encourage the utilization of technologies by farmers. Improved maize was introduced by PROSAB in 2004 to contribute to food security and reduce poverty among farmers. This study was therefore designed to investigate the socio-economic characteristics of the respondents in the study area as well as on agricultural innovation utilization (improved maize production technology).

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METHODOLOGY

The study was conducted in Southern Borno, Nigeria, where improved maize varieties and associated management practices are being promoted for both food and commercial purposes by Promoting Sustainable Agriculture in Borno (PROSAB). Multi-stage sampling technique was used to select sample for the study. In the first stage, three communities were randomly selected in each of the four Local Government Areas (LGAs) of Biu, Damboa, Hawul and Kwaya-Kusar. In the second stage three improved maize producing communities were selected from each of the earlier selected LGAs, making a total of 12 communities used for the study. In stage three, 360 respondents were proportionately selected from the 12 communities earlier selected as follows: Filin Jirgi 40, Mirnga 50, Tila 20, Azir 10, Sabon Gari 25, Kimba 15, Yimirshika 45, Marama 75, Shaffa 30, Wandali 25, Ngabu 15 and Guwal 20, making a total of 360 respondents. Structure interviews were granted to the 360 respondents.

Both descriptive and inferential statistics were used to analyze the data collected for the study. Regression (OLS) model was used in analyzing the influence of socio-economic characteristics of the respondents on their utilization of agricultural innovation (improved maize production technology)while descriptive statistics such as mean, frequency and percentages was used to categorized the socio-economic characteristics of the respondents.

Theoretically, the Regression model is expressed as:

$Y = f\ (\beta\ X_i\ .\ U)$

Where:

Y = The dependent variable of the model is the utilization of the agricultural innovation by the respondents. The variable is operationalized as the knowledge of maize farmers on improved technology practices. Salient features of the improved technology including management practices such as planting date, planting space; fertilizer application, weeding, and pest and disease control were considered. The dependent variable (Y) takes the values between 1to5 based on the utilization of agricultural innovation by the redpondents. Respondents that utilize only 1 agricultural innovation have their Y value equal to 1, those who utilize 2 agricultural innovation have their value to be 2, and this continues to the maximum of 5 to the respondent that have utilized all the 5 agricultural innovations.

X_i = set of explanatory variables comprising socio-economic and institutional.

U = random error term.

β = parameters to be estimated.

i = 1, 2, 3....., n number of independent variables.

Explicitly, the regression model is expressed as:

$$Y = \beta_o + \beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\beta_8X_8+\beta_9X_9+\beta_{10}X_{10}+ \beta_{11}X_{11} + e$$

Y = Utilization of agricultural innovation by the respondent (improved maize production technology)

X_1= Age

X_2= Sex

X_3= Level of education

X_4= Farm size (ha)

X_5= Household size

X_6= Income (₦)

X_7= Extension contact

X_8= Access to credit

X_9= Radio ownership

X_{10}= Membership of social organizations

X_{11}= Cosmopoliteness

βo = Constant

β_1-β_{11}= Coefficients

e = Error term

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

Table1. *Distribution of respondents based on socio-economic characteristics (n=360)*

Socio-economic variables	Frequency	Percentage	Mean	S.D
Age category(years)				
≤20	3	0.08		
21 - 30	49	13.05		
31 - 40	90	24.09	**44.24**	**12.55**
41- 50	86	23.09		
51- 60	81	22.06		
≥60	51	14.03		
Household size(number)				
≤3	37	10.04		
3 - 5	95	26.05		
6 - 8	119	33.00	**7.09**	**4.09**
9 -11	66	18.02		
≥11	43	11.09		
Gender				
Male	284	79.00		
Female	76	21.00		
Marital Status				
Single	43	11.09		
Married	302	83.09		
Widowed	14	3.09		
Divorced	1	0.03		
Level of education				
No formal education	102	28.03		
Adult Education	29	8.01		
Primary School not completed	18	4.09		
Primary School Completed	28	7.08		
Secondary School not completed	22	6.00		
Secondary school Completed	84	23.04		
Tertiary Education	77	21.03		
Farm size (ha)				
≤1	50	13.08		
1-2	233	64.07	**1.812**	**0.552**
3-4	68	19.00		
≥5	9	2.06		
Annual farm income(~~₦~~)				
≤20,000	12	3.04		
21,000-40,000	34	9.04	**141,625.71**	**83,178.12**
41,000-60,000	51	14.03		
≥60,000	263	73.00		
Annual non-farm income(~~₦~~)				
≤20,000	71	19.07		
20,000-40,000	123	34.00	**61,955.49**	**42,968.35**
41,000-60,000	71	19.07		
≥60,000	95	26.05		

Source: *Field survey, 2010*

Table 1 indicates that 63.1% of the respondents fell within the age bracket of 50 years and below, 22.6% were within the age bracket of 51-60 years, while 14.3% of them were above 60 years of age with the mean age of 44.24 years. By implication, the study area has a large number of able-bodied farmers who have a greater tendency to adopt new innovations. Adesina and Zinnah (1992) and Odoemenem and Obinne (2010) reported that middle aged farmers are relatively more open to risk taking and have longer planning horizon than older people.

Table 1 also reveals that majority (79%) of the respondents were male with corresponding female respondent strength of 21%. The most probable reason for such overwhelming majority of male farmers is that male generally constitutes the household heads with significant capacity to represent households in decision making situations. Various studies (Onu, 2006; Idrisa *et al*., 2007) indicated that gender plays significant role in accessing production resources and hence utilization of agricultural innovations.

The study revealed that majority (83.9%) of the respondents were married, 11.09% were single, and 3.9% were widows while 0.03% was divorced (Table 1). Marital status has implication for utilization/adoption of agricultural innovations and technologies (Idrisa, 2009). For instance, it is widely acknowledged that married people have more responsibilities and hence enter any enterprise with higher levels of seriousness. In this connection, married people frequently seek information about improved agricultural innovations/technologies so as to enhance the welfare of their families.

The study showed that the educational standard of the respondents was abysmally low. About half of the respondents had only adult education background, approximately 21% had up to tertiary level of education, while 28.06% had no formal education (Table 1). Educated people are expected to perform certain jobs and functions with higher efficiency and are also more likely to adopt innovations and new technologies faster than their uneducated counterparts (Agbamu, 2006).

Results from the study (Table 1) show that 69.09% of the respondents had less than eight members per family, 18.02% had between nine to eleven members per family, only 11.09% of the respondents had more than eleven members per family, with a mean household size of 7 persons. Family labour is an important component of factor of production for small-scale farmers. This is mainly because the subsistence farm households are resource poor and depend on family labour for agricultural activities which in most instances is labour intensive (Idrisa, 2009).

As shown in Table 1, majority (64.07%) of the respondents had between 1-2 hectares of land, 13.8% had less than 1 hectare, 19% had between 3-4 hectares, while 2.06% had 5 or more hectares of farms, representing a mean farm size of 1.81hectares. This situation is typical of farming in third world countries which is characterized by small land holding (World Bank, 2008).

The results revealed that majority (73%) of the respondents had an annual farm income of more than ₦60,000 per annum, 14.03% had between ₦41,000 - ₦60,000, 9.4% realized between ₦20,000 – ₦40,000, while 3.04% earned less than ₦20,000. The mean annual farm income was found to be ₦ 141,625.71 (Table 1). Inadequate resource base is one of the major constraints facing majority of small-scale farmers who constitute the majority of farmers in developing countries, including Nigeria. Studies by Ouma *et al*. (2006); Agbamu (2006) had shown that there is a positive relationship between farmers' level of income and utilization of agricultural innovations.

Multiple Regression Analysis of Factors Influencing Utilization of Agricultural Innovation by Respondents

Table2. *Multiple regression analysis of factors affecting utilization of agricultural innovation by respondents*

Variables	Estimated coefficients	P-value
(Constant)	0.881	.000***
Age	0.028	.000***
Sex	0.619	.004***
Level of education	0.046	.001***
Farm size	0.328	.003***
Family size	0.001	.975
Income	2.787E-7	.155
Extension contact	0.582	.000***
Access to credit	-0.108	.536
Radio ownership	0.412	.001***
Number of social organization belonged	0.147	.421
Cosmopoliteness	0.120	.022**
R^2	0.84	

Source: *Regression extract, 2010*

****Significant at 1%*

***Significant at 5%*

The coefficient of age was significant P $\leq$ 0.01 and relates positively with agricultural information utilization (Table 2). This implies that utilization of agricultural innovations increases with the age of the farmer which corroborates the finding of Ofuoku *et al.* (2006) who found that age is related to innovation utilization explaining that; the older the farmers are the more likely they are willing to put farming related information to use. This observation however, does not agree with (Lemchi *et al.* 2003; Asiabaka *et al*. 2001; Odoemenem and Obinne, 2010) who stated that the older the farmer becomes, the more risk averse he/she is, to utilize agricultural innovation. Table 2 shows that the sex of the respondents was a very important factor that influences agricultural innovation utilization. The positive and significant (P< 0.01) relationship between gender of respondents and agricultural information utilization in this study also agrees with an earlier study (Onu, 2006) which reported that gender plays significant role in accessing agricultural information and hence utilization of innovation.

Table 2 again shows a positive and significant (P< 0.01) relationship between the level of education and agricultural innovation utilization which agrees with earlier studies (Ofuoku *et al*., 2006; Abdul *et al*., 2003) that the level of education of farmers has significant relationship with innovation utilization. Also, Table 2 indicates a positive and significant (P< 0.01) relationship between farm size and agricultural innovation utilization which confirms the assertions of previous workers (Onu, 2006; Bamire and Manyong 2003; Surri (2005) who reported that the larger the size of the farm, the more likely the farmer were to adopt innovation. The coefficient of extension contact was found to be significant (P $\leq$ 0.01) and relates positively with agricultural innovation utilization (Table 2).

Extension contact determines the information that farmers obtain on production activities and the application of innovations through counselling and demonstrations by extension agents. The result is in consonance with findings by Onu (2006); Ouma *et al.* (2006) that the number of extension contact positively influenced the utilization of improved innovation/technology by farmers. Radio ownership was positive and significant (P< 0.01) in influence on the utilization of agricultural innovation by respondents and corroborates the findings of (Ani, 2004; Buba 2003 and Ogunbameru, 2001). The effectiveness of radion lies in its potential in cutting across the literacy barriers which is readily understood by all farmers.

Finally the coefficient of cosmopoliteness was significant (P $\leq$ 0.05) and relates positively with agricultural innovation utilization (Table 2). Cosmopoliteness is the degree of orientation of the respondents towards outside the social system to which they belong. Interaction with people outside one's social system tends to expose him/her to have access to more information accessibility on new agricultural innovations.

CONCLUSION AND RECOMMENDATIONS

Utilization of innovation could assist the farmers increase their production levels and profit margin considerably. Their capacity to educate their children would be enhanced and their standards of living improved. Government should therefore assist farmers to access the more efficient factors which influence innovation utilization. In a study area where illiteracy level was high, the employment of extension agents and the use of radios would facilitate innovation utilization.

In this connection, research institutions and organizations related to agriculture such as IITA, PROSAB and BOSADP should intensify their research efforts in breaking new grounds for innovations to be disseminated by extension agents and radio broadcasts.

REFERENCES

Abdul, R.Q., Ashfaq, H.M. and Sultan, A.C. (2003). Farmers Characteristics Affecting Adoption of Agricultural Innovations. *Journal of Rural Development and Administration*. Vol. XXV, (3): 111-113

Adesina, A.A. and Zinnah, M.M. (1992). Technology Characteristic, Farmer's Perception and Adoption Decision: A Tobit Model Application in Sierra Leone. *Agricultural Economics*. 19: 297-311

Agbamu, J.U. (2006). *Essentials of Agricultural Communications in Nigeria*. First Edition, Malthouse Press Limited. Lagos, Nigeria. pp. 47 – 81.

Ajibefun, I.A. (2006). Linking socio-economic and policy variables to technical efficiency of traditional Agricultural production: Empirical evidence from Nigeria. *Paper presented at International Association of Agricultural Economist' Conference. Gold Coast, Australia,* August 12-26.

Ani, A.O. (2004). *Women in Agriculture and Rural Development*, Prisquilla Publishers, Nigeria. Pp. 84

Asiabaka, C.C., Morse, S. and Kenyon, L. (2001). The Development, Dissemination and Adoption of Technologies Directed at Improving the Availability of Clean Yam Planting Material in Nigeria and Ghana. Report of a Study Mission Commissioned By U.K Government Department of International Development (DFID) Crop Production Program (CPP) 11-22 June.

Bamire, A.S. and Manyong, B. (2003). Profitability of Intensification Technologies Among Small-holder Maize Farmers in the Forest-savannah Transition Zone of Nigeria. *Agriculture, Ecosystem and Environment*. 100 (1 &2): 111-118

Buba, M.B. (2003). Introduction to Nomadic Education Studies, Education and Management Services, Yola, Adamawa State, Nigeria. Pp. 120-121

CIMMYT (1990). Centro Internationel de Majoratientto de Maiz Y Trigo (CIMMYT). The Adoption of Agricultural Technologies: A Guide Survey Design, CIMMYT, Mexico.

Doss, C.R. (2003). Analysing technology adoption using micro studies: Limitations, challenges and opportunities for improvement. Agricultural Economics. 34: 207-219.

Doss, C.R. (2006). Understanding farm level technology adoption: Lessons learnt from CIMMYT Economic working paper No. 30-07, Mexico, D.F.

Fakorede, M.A.B., Fajemesin, J.M., Ajala, S.O., Kling, J.G. and Menkir, A. (1999). Hybrid Maize and Hybrid Seed Production in Nigeria: Lessons for other West and Central African Countries. Pp. 174 – 182. In: Badu-Apraku, B. Fakorede, M.A.B., Ouedraogo, M. and Carsky, R.J. (ed.) Impact, Challenges and Prospects of Maize Research and Development in West and Central Africa. Proceedings of a Regional Maize Workshop. IITA – Cotonou, Benin Republic, 4 – 7 May, 1999, WECAMAN/IITA.

Idrisa, Y.L., Sulumbe, I.M. and Mohammed, S.T. (2007). Socio-economic Factors Affecting the Participation of Women in Co-operative Activities in Gwoza Local Government, Borno State. *Journal of Agriculture, Food, Environment and Extension.* 6(2), 72-78

Idrisa, Y.L. (2009). Analysis of the Determinants of Soybean Production Technology Adoption by Farmers in Southern Borno, Nigeria. A Ph. D Thesis, Department of Agricultural Economics and Extension, University of Maiduguri.

Kamara, A.Y., Kureh, I, Menkir, A., Kartung, P., Tarfa, B. And Amaza, P.S. (2005). Participatory On-farm Evaluation of the Performance of the Drought-tolerant Maize Varieties in the Guinea Savanna of Nigeria. *Journal of Food, Agriculture and Environment*. 4(1): 192-196

Obwoma, M. (2000). Determinants of technical efficiency diffrencials among small scale farmers in Uganda: A case of tobacco growers. Final research report presented at a Biennial workshop. Nairobi, Kenya.

Lemchi, J., Tshiuza,. M, and Tenkouano , A. (2003). Factors Driving the Intensity and Rate of Cooking Banana Adoption in Nigeria. *Journal of Agricultural Social Research.* 3(2): 67-78

Obwona, M. (2000). Determinants of Technical Efficiency Differentials among Small and Medium Scale Farmers in Uganda: A Case of Tobacco Growers, *Final Research Report Presented at a Biennial Workshop, Nairobi, Kenya.*

Odoemenem, I.U and Obinne, C.P.O. (2010). Assessing the Factors Influencing Utilization of Improved Cereal Crop Production Technologies by Small-scale Farmers in Nigeria. *Indian Journal of Science and Technology*. 3(1): 180-183

Ofuoku, A.U., Uzokwe, U.N. and Ideh, V. (2006). Comparative Analysis of Co-operative and Non-Cooperative Fish Farmers in Central Agro-ecological Zone of Delta State, Nigeria. *Extension Farming System Journal*. 2(1): 97-104

Ogunbameru, B.O. (2001). *Practical Agricultural Communication*. Daily Graphics (Nig). Ltd. Ibadan. pp. 45 – 64.

Onu, D.O. (2006). Socio-economic Factors Influencing Farmers' Adoption of Alley Farming Technology Under Intensified Agriculture in Imo State, Nigeria. *The Philippine Agricultural Scientist*. 89 (2)45-52

Ouma, J.O., De Groot, H. and Owuor, G. (2006). Determinants of Improved Maize Seed and Fertilizer Use in Kenya: Policy Implication. *Paper Presented at the International Association of Agricultural Economists' Conference, Gold Cost, Australia, August 12-18.*

PROSAB (2006). Community and Village Survey Report. Gaza Printing Press Maiduguri.

Seyoum, E.T., Battese, B.E. and Flemming, E.M. (1998). Technical efficiency and productivity of maize farmers in eastern Ethiopia: A case study of farmers within and outside the Sassakawa Global 2000 project. *Agricultural economics* 19: 341-348.

Surri, T. (2005). Selection and Comparative Advantage in Technology Adoption. World Bank Research Observer. 12(2): 183-201

World Bank (2008). World Development Report 2008: Agriculture for Development. The World Bank Washington, DC