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RESEARCH ARTICLE

EFFECT OF EXTENSION CONTACT ON MAIZE PRODUCTION IN KACHIA LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

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ABSTRACT

This study assessed the impact of extension contact on maize production in Kachia Local Government Area of Kaduna State, Nigeria. Data were collected from 80 randomly sampled maize farmers from four villages in Kachia Local Government Area using a structured questionnaire. Data collected were analysed using descriptive statistics such as the frequency and percentages, and inferential statistics such as ordinary least square (OLS). The study showed that majority (68.7%) fall between the age range of 31 and 50 years while 16.3% of the respondents are below 30 years of age. This implies that the area is dominated by mid-age farmers who are still very vibrant in terms of agricultural production. Majority (81.2%) of the respondents had one form of formal education or the other while 12.5% had no formal education and 6.3% had adult education. Only 25% of the respondents had access to extension personnel. Among the regression results obtained from the functional forms analyzed, cobb-douglas was used as the lead equation because of its level of significant and R^2 value. It had an R^2 value of 0.945 implying that 94.5% of variation in maize output (Y) is explained by the independable variables (X_1 - X_6) in the regression model, while the remaining 5.5% is as a result of other factors not included in the model. The study showed that there was a significant relationship between extension contact and maize output. It was therefore recommended that Extension service unit should be strengthened by employing and training more staff to reach out to farmers as this will increase farm yield.

INTRODUCTION

The term extension was derived from the practice of British Universities having one educational programme within the premises of the university and another away from the university buildings. The programme conducted outside the university was described as "extension education". The expression connoted an extension of knowledge from the university to places and people far beyond. The term "Extension Education" was first introduced in 1873 by Cambridge University in England to describe a particular system dedicated to the dissemination of knowledge to rural people where they lived and worked. Within a short time, the idea had spread to other parts of Britain, Europe, North America and Africa (Okwoche and Asogwa, 2012). Many factors contribute towards the development of agriculture, including extension as an institutional input. Farmers need to be aware of the constant change in agricultural technologies and techniques as this will enable them use agricultural innovations for the exploitation of inherent yield potentials. All over the world, the public sector plays a dominant role in the provision of agricultural extension services (Lees, 1991; Swanson *et al*., 2007). Agricultural extension by nature has an important role in promoting the adoption of new technologies and innovations (Jamilah *et al*., 2010). Agricultural extension creates changes through communicating with farmers and also educating them so as to improve their attitude, knowledge and skills. The role of extension involves dissemination of information, building the capacity of farmers through the use of different communication methods and helping farmers to make informed decisions (Sinkaiye, 2005). Extension services also play a very important role in providing useful information on sustainable agricultural education. Thus, the role of extension is essential in supporting sustainable agriculture which is moving from production to a wider set of sustainability (Salam, 1994; Ali *et al*., 2012). The effectiveness of extension service is highly dependent on the ability of competent extension workers to transfer information from extension organizations to the clientele. However, serious reservations are being expressed about the performance and capability of this sector, it has been argued that the performance of public agricultural extension in developing countries has been disappointing and has failed to transfer agricultural technology to farmers. Furthermore, a large number of farmers remain outside the ambit of extension providers (Schwartz, 2004). Maize is a popular cereal crop

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also known as corn and botanically known as *zea mays*. It is cultivated for food, feed and fodder. Maize belongs to the grass family. It is a cereal grain that was domesticated in Mesoamerica and later spread to the rest of the world after European contacts. The Portuguese introduced maize to West Africa in the 16th century (Ebojei *et al*., 2012). Maize is one of the major staples in Nigeria and therefore is of vital concern to agricultural policy makers.FAO (2009) observed that Nigeria current maize production is low when compared to world average production and that of other African countries like South-Africa, Cameroon, Ethiopia and Kenya. Current maize production in Nigeria is about 8 million tonnes and average yield is 1.5tonnes per hectare compared to world average of 4.3 tonnes/ha and that of other African countries like South Africa with 2.5 tonnes/ha, Cameroon 1.9 tonnes/ha, Ethiopia 1.8 tonnes/ha and Kenya 1.7 tonnes/ha (FAO 2009). The rate at which Nigeria food production grows has been very low too. Food production grows at the rate of 2.5% per annum in recent years while food demand has been growing at the rate of more than 3.5% per annum due to high rate of population growth of 2.83% (FOS 1996; Ogbeide, 2012).

There has been a growing gap between demand for maize and its supply arising from low productivity. The stronger force of demand for maize relative to supply is evidenced in frequent rise in price of maize and therefore has great implication for the food security status and economic development of Nigeria. To bridge the demand-supply gap, extension agents need to educate maize farmers on improved methods of maize farming such as the use of hybrid seeds, fertilizer, pesticides, herbicides and other new technologies in farming system. Therefore, according to Mgbada (2006) Access to adequate information is very essential to increase agricultural productivity. Ascertaining the feasibility of extended technologies in terms of maize production is very crucial. It is against the backdrop of aforementioned problems that this study tend to focus on effects of extension activities on maize production in the study area and provide answers to the problems, hence the following objectives.

i. describe the socio-economic characteristics of farmers growing maize in the study area.
ii. determine the level of extension contact with maize farmers.
iii. examine the effect of extension contact on maize production.
iv. identify the constraints faced by farmers in adopting extension services.

Literature Review

Agricultural extension was once known as the application of scientific research and new knowledge to agricultural practices through educating farmers but the field of extension now includes a wider range of communication and learning activities organized by professionals from different disciplines (Saville, 1965; Ali *et al.,* 2012). Extension agents receive regular training to enhance their technical skills which they then hope to pass to all farmers through regular communication with small numbers of selected contact farmers. The contact farmers are selected base on the following criteria: literacy, wealth, readiness to make changes. So these set them apart from the rest of the community but the secondary transfer of technical message from contact farmers to the community has been less successful than predicted and adoption rate are commonly very low among non-contact farmers (Antholt, 2004). Extension agents need to involve farmers themselves in the process of extension. Participation by farmers must be clearly interactive and empowering because allowing farmers to just come to meetings or letting a few representatives sit on committee will be insufficient (Antholt, 2004).Performance of extension agents is expected to increase if they have programmes that develop competency, such programmes will keep the extension agents competent and also improve their performance. The programme must be upgraded and the extension agents must be assessed continuously (Tiraieyari *et al*., 2010).Extension agent is not merely occupying a bridge position but facilitates to improve the efficiency and effectiveness of both farmers and researchers so as to effectively transfer agricultural technologies to farmers (Rivera *et al*., 2007). Proper management of information sets a foundation for the delivery of efficient and effective extension service by providing accurate information to those who need it at when they need it. Also, measuring the attitude of farmers towards extension services they receive is crucial in providing sustainable agricultural extension services (Allahyari, 2009).

In the past and also in recent times, a lot of works have been done on effects of extension activities towards achieving sustainable agriculture in Nigeria and the world at large. Okwoche and Asogwa (2012) carried out a study on impact of extension services on cassava farming in Benue state, Nigeria. The result showed that only 47.78% of the farmers had access to extension services while 52.22% did not and the impact of the extension agent less than expected due to lack of adequate mobility to reach some of the farmers in far locations. Maize is known in some English-speaking countries as corn. Most historians believe maize was domesticated in the Tehuacan Valley of Mexico. The original wild form has long been extinct. Maize is perhaps the most completely domesticated of all field crops. Corn (maize) belongs to the family of grass (graminaeae) and botanically called *zea mays*. Corn is often classified as dent corn, flint corn, flour corn, popcorn, sweet corn, waxy corn and Pod corn. After rice, millet and wheat, corn or maize is one seasonal food (cereals) that have been known to most nations of the world right from the ancient times. During its season and depending on the nature of the soil, maize grows to a height of between 5 to 8 feet and is harvested within 70 to 90 days after planting. Maize is fed to livestock, used as human food and industrial products such as adhesives, chemicals, explosives, paints, abrasives, dyes, insecticides, pharmaceuticals, organic acids, solvents, anti-freeze soaps and many more.

MATERIALS AND METHODS

Kachia is a one of the twenty-three Local Government Areas of Kaduna state, Nigeria situated at the southern geo-political zone. Its headquarters is in the town of Kachia. It is located on the longitude 30^{o} E and latitude $11^{0}30^{1}$N of the equator. The land area is 4,632 square kilometers and a population of 244,274(NPC, 2006). The Local Government Area is characterized by two seasons – dry and wet seasons. The dry season begins from November to mid-April while the rainy season starts from mid-April to October. The annual rainfall is

between 1015mm to 1530mm while the temperature ranges from 18°C -23°C. Random sampling technique was used to select four villages (Sabon-maro, Rijana, Doka, and Iluwo) from Kachia Local Government Area and twenty households each from the villages making a total of eighty household maize farmers for this study. A well structured questionnaire was administered with the assistant of trained enumerators to obtain my primary data. Information collected covers socio-economic characteristic of the sampled farmers (such as age, sex, educational level, marital status, etc.) and extension contacts made by the extension agents (i.e. how often they were visited, how often innovations were introduced and adopted). Data were analyzed using both descriptive and inferential statistic tools. Descriptive statistics such as the use of frequency distribution and percentages were used to achieve objectives i, ii and iv while inferential statistics such as Ordinary Least Square (OLS) was used to achieve objective iii. Different functional forms such as linear, double-log, exponential and semi-log were used. The lead equation was chosen for further discussion base on econometrics and statistical rules such as the explanatory power of the model (R^2), the statistical significance of the estimated co-efficient as well as the f-statistics.

Ordinary Least Square (OLS)

Maize production is influenced by a number of factors. The four functional forms OLS were used to analyze these factors namely; linear, semi-log, cobb-douglas and exponential. In implicit form, the model was specified as follows.

$Y= (X_1, X_2, X_3, X_4, X_5, X_6, u)$

Where

Y = output of maize (kg)
X_1 = farm size (ha)
X_2 = labour (mandays)
X_3 = fertilizer (kg)
X_4 = herbicide (litre)
X_5 = seed (kg)
X_6 = extension contact (number of contact)
u = error terms

The explicit forms of the functional forms are specified as follows:

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \ldots\ldots\ldots\ldots + b_6X_6 + u$(Linear)
$\text{In } Y = \text{In}b_0 + b_1\text{In}X_1 + b_2\text{In}X_2 + \ldots\ldots + b_6\text{In}X_6 + u$(Double log)
$\text{In } Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + \ldots\ldots + b_6X_6 + u$(Exponential)
$Y = \text{In}b_0 + b_1\text{In}X_1 + b_2\text{In}X_2 + \ldots\ldots\ldots\ldots + b_6\text{In}X_6$(Semi log)

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondent

Some of the characteristics considered during the field work include: age, gender, marital status, educational level, farming experience and household size. The results in table 1 revealed that majority of maize farmers in Kachia Local Government Area, 68.7% fall between the age range of 31 and 50 years while 16.3% of the respondents are below 30 years of age. This implies that the area is dominated by mid-age farmers who are still very vibrant in terms of agricultural production. This is in consonance with Okwoche and Asogwa (2012) who reported that farmers are often within the age range of 30 and 50 years. This is because farming requires adequate attention and a lot of sense of responsibility. 87.5% of sampled farmers are male while 12.5% of the respondents are female. This indicates that maize production in the study area is mostly done by men. Oladipo *et al* (2008) posited that men are more involved in maize production than women. This shows gross inequality in gender distribution and calls for the empowerment of women so that they can contribute their own quota to maize production in the area. This study also revealed that a large number of the respondents are married and majority (81.2%) of the respondents had one form of formal education or the other while 12.5% had no formal education and 6.3% had adult education. Education is the planned process of bringing desirable changes in the behaviour, skills, attitude and knowledge as regards to production. Education helps in efficient use of the limited resources which result in high production (Ogundari and Ojo, 2005).

Formal education has a positive influence on the adoption of innovation (Njoku 1991; Ogbeide 2012). 38.8% of the respondents have farming experience of 15 years and above, 30% have farming experience within the range of 11-15 years, 27.5% have farming experience within the range of 6-10 years while 3.7% of the respondents have farming experience within the range of 1-5 years. This connotes that as years go by, the percentage of respondents involved in maize production gradually declined. This finding is in contrast with Okwoche and Asogwa (2012) who posited that farmers with farming experience of less than 5 years are more than those with over 15 years farming experience. More also, from the results farmers with household range of 1-5 constitute 31.2%, household range of 6-10 constitutes 47.5%, while household range of 11-15 constitutes 21.3%. This indicates that the household sizes of the study area are quite large and therefore provide free and cheap labour at the various stages of their farm operations. Household size is the number of people living together in one house. Large household size can generate family labour (Olawumi, 2012). Majority of the farmers 83.7% have farm size between 0.1 to 3 hectares while 16.3% have farm size of 4 hectares and above.

Farm sizes to a greater extent determine the yield of farmers. Farmers with large farm lands will be motivated to cultivate more and therefore have higher yield. The variation in farm size is due to the fact that the most common mode of land acquisition in the study area is through inheritance and the amount of land inherited depends on position of the farmer in the family and the number of wives and siblings. In terms of capital acquisition, all the respondents acquired capital for maize production through their personal savings while only 5% acquired capital through loans from relatives. The respondents had no other sources of capital such as banks, cooperatives, government agencies etc to borrow funds from. Obansa and Maduekwe (2003) recommended that agricultural financing should be given paramount attention in policy formulation. The majority (70%) of the respondents do not belong to co-operative society while 30% are members of co-operative society. Those that do not belong to any co-operative society are more because they lack knowledge on the benefits

Table 1. Socio-Economic Characteristics of the Respondents

	Frequency	Percentage
Age(years)		
≤ 30 years	13	16.3
31-40 years	35	43.7
41-50 years	20	25.0
51 - 60years	12	15.0
Total	80	100
Gender		
Male	70	87.5
Female	10	12.5
Total	80	100
Marital Status		
Single	6	7.5
Married	74	92.5
Total	80	100
Educational Level		
No Formal Education	10	12.5
Adult Education	5	6.3
Primary Education	19	23.7
Secondary Education	34	42.5
Tertiary Education	12	15.0
Total	80	100
Farming Experience		
1-5	3	3.7
6-10	22	27.5
11-15	24	30.0
>15	31	38.8
Total	80	100
Household Size		
1-5	25	31.2
6-10	38	47.5
11-15	17	21.3
Total	80	100
Farm Size		
0.1 – 2.0	32	40.0
2.1 – 4.0	35	43.7
4.1 – 6.0	13	16.3
Total	80	100
Co-operative Society		
No	56	70.0
Yes	24	30.0
Total	80	100

Source: Field Survey, 2013

Table 2. Level of Extension Contact of the Respondents

	Frequency	Percentage
Awareness of extension services		
No	21	26.2
Yes	59	73.8
Total	80	100
Access to extension agent		
No	60	75.0
Yes	20	25.0
Total	80	100
frequency of extension visits		
No visits	60	75.0
Quarterly	20	25.0
Total	80	100
Knowledge of Innovation		
No knowledge	60	75.0
Quarterly	11	13.7
Yearly	9	11.3
Total	80	100
Adoption of Innovation		
No	60	75.0
Yes	20	25.0
Total	80	100

Source: Field Survey, 2013

of co-operative societies. A co-operative society is an organization of people with common interest whose aim is to cater for the general good and interest of its members. 97.5% of the respondents use hired labour in addition to their family labour. This is due to large farm size of the respondents as family labour alone may not be enough in carrying out all the farm operations.

Awareness of extension services

Extension services are services rendered to farmers through educational procedures so as to improve farming methods and techniques which will result to high yield and income. Table 2 revealed that majority (73.8%) of the sampled farmers were aware of extension services while 26.2% were not. Those that were aware knew about extension services by means of radio, television, contact farmers and personal contact with extension agents. This finding is in conformity with Alfred and Fagbenro (2005) who noted that extension agents, radio and television were the most common information sources used by farmers. Also, only 25% of the sampled farmers had contact with extension agents while 75% have no contact. This finding disagrees with Onemolease and Alakpa (2009) assertion that most farmers have contact with extension workers. Most farmers in the study area did not have access to extension workers and are therefore not aware of current innovations in maize production. The reason why majority of the farmers had no access to extension agents could be that agricultural extension agents are under-staffed in the study area.

Ogunbameru (2005) stated that it is not possible for government alone to support extension programmes in all ramifications. It therefore implies that 25% of the respondents were visited quarterly by extension agents while 75% were never visited by extension personnel. This indicates that most of the farmers relied on 'second-hand' information from friends and contact farmers. In respect to knowledge of new innovation in maize production, 75% of the sampled farmers had no contact with extension agents, 13.7% respondents said they were told of innovations in maize production quarterly by extension agents while 11.3% confirmed that extension agents introduce innovations on maize production to them yearly. Organizing frequent visits by extension personnel will expose farmers to new farming techniques. The study also revealed that 75% of the respondents did not adopt any innovations because they had no contact with extension agents but 25% of the sampled farmers who had contacts with extension personnel adopted one form of innovation or the other. This indicates that farmers are willing to adopt relevant agricultural innovations if extension personnel reach out to them. Contact with extension workers is known to facilitate farmers' adoption of improved technologies (Zegeye 1990; Onemolease and Alakpa 2009).

Effects of Extension Contact on Maize Production

The estimated productions functions arising from the multiple regression analysis are presented in table 3. Six variables were regressed which are; farm size (X_1), labour (X_2), quantity of

Table 3. Regression coefficients of the Extension Contact Effects on Maize Production

Variables	Cobb-douglas	Linear	Exponential	Semi-log
Constant	6.240	-241.732	7.020	-3433.585
	(18.028)	(-2.482)	(121.184)	(2.460)
Farm size (ha)	0.755	1729.916	0.492	2960.172
	(7.702)***	(13.595)***	(6.503)***	(7.491)***
Labour (mandays)	0.012	0.176	0.000	443.993
	(0.272)Ns	(0.621)Ns	(-0.929)Ns	(2.438)**
Fertilizer (kg)	0.095	0.559	0.000	113.812
	(3.302)***	(1.211)Ns	0.411)Ns	(0.983)Ns
Herbicide (litre)	-0.011	-8.018	-0.003	22.010
	(-0.470)Ns	(-2.894)***	(-1.893)*	(0.230)Ns
Seed (kg)	0.194	1.393	0.000	602.300
	(2.129)**	(0.267)Ns	(-0.199)Ns	(1.638)Ns
Extension contact	0.304	117.738	0.426	736.280
	(5.633)***	(9.010)***	(5.503)***	(3.379)***
R^2	0.945	0.977	0.882	0.938
Adjusted R^2	0.940	0.975	0.872	0.933
F value	207.875***	519.523	91.012***	184.967***

Note: *** implies significant at 1%, ** implies significant at 5%, * implies significant at 10% and Ns implies not significant.

fertilizer (X_3), herbicide (X_4), seed (X_5) and extension contacts (X_6) while the output of maize (kg) is Y in the production function. Among the regression results obtained from the functional forms analyzed, cobb-douglas was used as the lead equation because of its level of significant and R^2 value. It had an R^2 value of 0.945 implying that 94.5% of variation in maize output (Y) is explained by the in dependable variables (X_1- X_6) in the regression model, while the remaining 5.5% is as a result of other factors not included in the model. Out of the six independent variables, four (farm size, fertilizer, seed and extension contact) were found to be statistically significant. Extension contacts (X_6) from the result is positive (0.304) and statistically significant at 1% level of probability. This implies that extension contacts have significant effect on the output of maize. It also means that an increase in the level of extension contact will result in increase in maize production in the study area. This finding is in contrast with Ali *et al*., (2012) who reported that extension contacts made no difference in the achievement of farmers regarding their production. The null hypothesis (H_0) states that there is no significant relationship between access to extension contact and maize output. The estimated coefficient of extension contact is positive (0.304) and statistically significant at 1%, we hereby reject the null hypothesis (H_0) and accept the alternative hypothesis that there is a significant relationship between extension contact and maize output.

Constraints Faced in Adopting Extension Services

The result in table 4 revealed that 9.1% of the sampled farmers perceived the innovations introduced by extension personnel as being difficult to understand, 36.3% of the respondents complained that the innovations introduced were expensive, 27.3% reported that the innovations were different from the farm practices they were used to while another 27.3% said they were not sure (uncertain) of the productivity of the innovation.

Table 4. Constraints Faced in Adopting Innovation through Extension Agents

Constraints faced by farmers	*Frequency	Percentage (%)
Difficult to Understand	20	9.1
Expensive	80	36.3
Different	60	27.3
Uncertain	60	27.3

Source: Field data, 2013
*Multiple responses

Summary and Conclusion: The study assessed the effect of extension contact on maize production in Kachia Local Government Area of Kaduna state, Nigeria. Data were collected from 80 randomly sampled maize farmers from four villages in the Local Government Area using well structured questionnaire. Data collected were then analyzed using descriptive and inferential statistics such as ordinary least square (OLS). Among the regression results obtained from the functional forms analyzed, cobb-douglas was used as the lead equation because of its level of significant and R^2 value. It had an R^2 value of 0.945 implying that 94.5% of variation in maize output (Y) is explained by the independable variables (X_1 - X_6) in the regression model, while the remaining 5.5% is as a result of other factors not included in the model. Extension contacts (X_6) from the result is positive (0.304) and statistically significant at 1% level of probability. This implies that extension contacts have significant effect on the output of maize. Although, only 25% of the respondents had access to extension personnel. Extension contacts (X_6) from the result is positive (0.304) and statistically significant at 1% level of probability. This implies that extension contacts have significant effect on the output of maize. Therefore, this study revealed that there was a significant relationship between extension contact and maize production output of the farmers in the kachia Local Government Area.

Recommendations: For effective and efficient policy formulation that will enhance women production and in turn ensure household food security in the country, the following recommendations are suggested.

i. Extension service unit should be strengthened by employing and training more staff to reach out to farmers as this will increase farm yield.
ii. Government should enforce the monitoring and evaluation unit of Ministry of Agriculture to monitor the performance of field agents.
iii. Farmers should through their cooperative societies ensure contacts with the extension agents to avoid waiting and hoping for extension agent will come to them.
iv. Government should subsidize farm inputs like fertilizers and agrochemicals, and also ensure that the costs of innovations are reduced since farmers complained that some new technologies are expensive.

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