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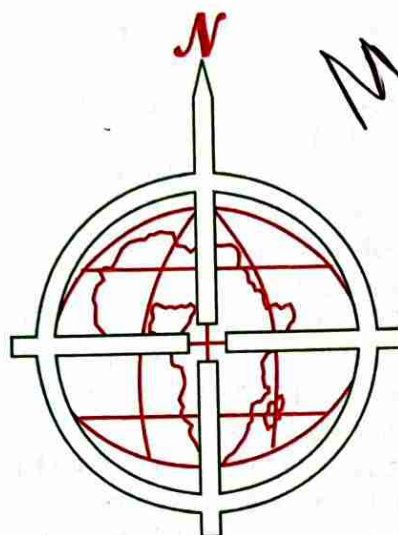
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Adoption of Agricultural Innovation among Farmers in Edu L.G.A., Kwara State, Nigeria

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Abstract

Sustainable crop production is an important aspect of agricultural production that needs to be emphasized. This study examined various agricultural innovation on sustainability of crop production in Edu Local Government Area of Kwara State, Nigeria with a view to examining the socio-economic characteristics of farmers; farmers' adoption of new innovation; and impact of adoption of innovation on farmers' productivity and income. Eighty-five farmers were randomly selected for this study. Frequency tables, percentages, charts and analysis of variance were used to analyze the collected data. The study revealed that the new techniques on agricultural productivity have significant impact on farmers' income ($F=1.950, p<0.05$). The study recommended an increase in the adoption of agricultural innovation which is a more potent approach to improve agricultural productivity among local farmers.

Key Words: Agriculture, Innovation, Farmers, Sustainability, Production, Crops, Mechanization

Introduction

Innovations are new methods, custom or devise used to perform a task. Innovation thereby involves ideas, which are perceived as new by an individual or group because it may come in different dimension thereby serving different purposes. Among the aspects of life which innovation is very crucial to, is agriculture. Absence of agricultural innovation is a major constraint to the development of agriculture in Nigeria, therefore it

is very necessary for farmers to have new ideas with which they can enhance their productivity. Innovation in agriculture may therefore come in several ways such as mechanical innovation (the use of tractors, builders, scrapers, and other heavy machine among others); biological innovation (introduction of new seeds, tubers or hybrid crops); chemical innovation (application of fertilizer, pesticides, insecticides etc) to control weeds pest, insect on the farm agronomic innovation (establishment of new agricultural management practices).

According to Maryville (1992), innovation is often viewed as the application of better solutions that meet new requirements, because it is an idea perceived as new technique in doing things by an individual. This implies that what is an innovation to one person may not be so to another.

The Federal Government of Nigeria recognizes the need to develop agricultural innovation and therefore set up some agricultural related research institutes. Consequently, first use and subsequent use of innovations occur at the same scale and adoption is treated as a discrete state (Doss 2003). Other innovations such as new crop varieties, new planting practices, new livestock treatments or micro-irrigation may be first used at a scale smaller than the entire enterprise (agriculture) and subsequently used more extensively. Innovations occurs at different scales and it follows that, for these innovations, adoption is treated as a more continuous state sometimes described as 'adoption intensity' which subsequently enhance level of production (Gebremedhin and Swinton 2003).

A lot of theoretical issues relating to the introduction of innovation into the agricultural practice started right from the agricultural revolution of the 60s and 70s and persists till today. For example; Norman (2003) wrote that new technology in order to stand a reasonable chance of being adopted has to be technologically viable; economically feasible and adoptable to the indigenous environment while Rothenberg (1994) argues that changes in adopted system may either arise within the farm or outside it. Lunning (1994) was of the opinion that for the adoption of innovation to take place, the profit that shall be acquired from the innovation when compared to the old method in existence must be in the ratio of 2 or 3 times as high during the initial phase of the adoption. Ukeje (1996) wrote that farmers have the capacity to respond to change and introduction of

new ideas having weighed the huge advantages to be derived from it. Pannell (1999) and Pannell et al. (2006) were of the view that, the population of potential adopters of an agricultural innovation may be regarded provisionally as the set of producers for whom adoption of the innovation would create an advantage because the innovation provides a more satisfactory mechanism for achieving their utilitarian, social and hedonic goals.

Ukeje (2005) stated that agricultural production is on two major factors; the first is the goal to be achieved which is agricultural production and it is aimed at satisfying need. The second is the equity position of the farmers. Finn et.al (2001) mentioned that the ability of small scale farmers to adopt new technology appears to be inversely related to the severity of pressure on the land and the limitations of the land itself. De Boer (1997) differentiated two stages in the development of agriculture. In the first stage, better varieties of seedling, fertilizer and plant protection are important while in the second stage, mechanization; water management and farm size become more important. According to Griliches, (1975), the extent to which farmer adopt available innovation and the speed they do so, determine the impact of the innovation in terms of productivity

and growth. Hayami and Ruttan (1985) formalized and empirically verified their theory of induced innovation and they closely linked the emerged of innovation with economic conditions. They argued that the search for new innovation is an economic activity that is significantly affected by economic conditions. They agreed that new innovations are more likely to emerge in response to scarcity and economics of opportunity, for example labour shortage will induce labour saving technologies.

Most of these theories do not indicate that agriculture innovation cannot be seen and treated as an isolated factor in the development process or transition of traditional agriculture to commercialized agriculture. They also make it clear that innovations do not have primary importance in the process but in general can only be applied successfully after other conditions are met or have been set in motion. Kidd (1998) carried out a study in 227 villages in four (4) south western Nigeria states and it was found that, of the recommendations made to the farmers in the state, cocoa spraying was widely adopted and maize growing scheme was well known but adopted by a few people. Factors leading to low adoption were given as lack of access to extension agents, lack of market for expanding product, lack of supervisions to ensure proper use of new techniques,

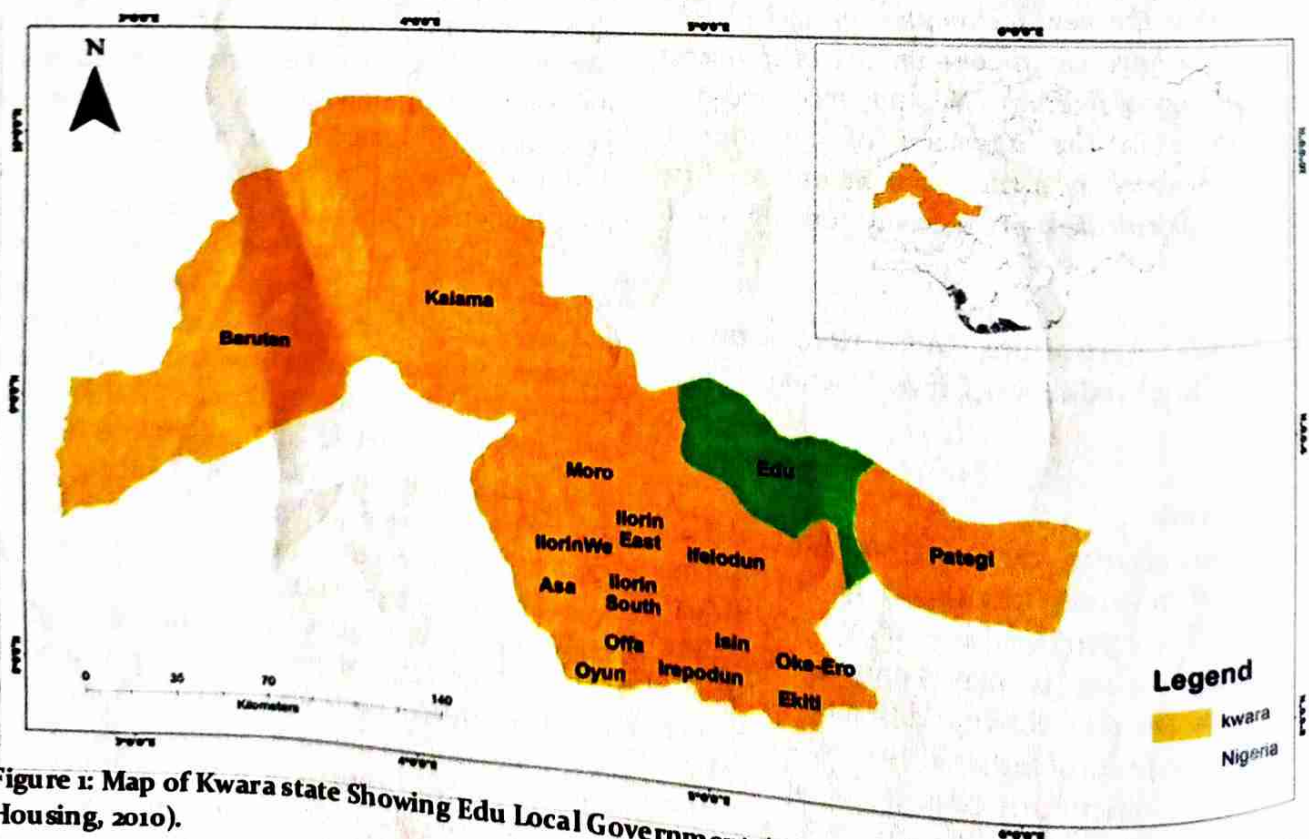


Figure 1: Map of Kwara state Showing Edu Local Government Area (Kwara State Ministry of Lands and Housing, 2010).

inadequate material and supplies at the right time, lack of credits facilities to implement the innovation and lack of effective demand for the product. In another study involving the planting of improved varieties of rice, cotton and the use of fertilizer to increase yields of available crops, Williams (1999), found that almost half of the farmers studied adopted the recommended practices of new techniques while others did not. Those who did not adopt the recommendation were of different opinion. About 48% farmers said that nobody has ever used the practices in their village, 16% said the new practice would not bring more income, 50% said they could not afford to use the practice due to cost of operation, 7% were with the view that they could not understand it well and 3% said that their farms were too small to adopt the new practice.

The main reason given by farmers for adopting the practices was that they felt more money could be made by it (76%), but some (16%) explained that they adopted the practices because the extension agent advised them to do so (Williams, 1999). In the same study, most of the cotton and rice growers unfortunately opted to go back to their old method of planting because the new varieties did not give better yields when planted by traditional method. The techniques and essential cultural practice recommended for planting the new varieties were too labour demanding. However most of the fertilizer adopters opted to continue to use fertilizer apparently because this does not require any drastic change in their farm practices. Obibuaku (1996) in his study identified the reasons for the high rate of adoption and the subsequent discontinuance with the use of hydraulic oil palm press. The agricultural assistants introduced the ideas of the hydraulic oil palm press to the farmers by organizing an excursion for them to see one in use. He however excluded the women who normally do the processing of the oil from the excursion. The farmer after seeing one in operation, made the decision to try the oil palm press to the farmers free of charge. Initially, 72% of the women used the press but in less than a year only 24% were still using it. The main reason for the low rate of continuance was explained by tossing over the role of women in decision making. The women were not happy because the new technique could not afford them opportunity of using the by-product which they usually sold for fuel. Furthermore, the

press was a free gift from the government and as such, they did not feel any commitment to continue using it.

Agricultural innovation is very important with its effect been felt in some areas therefore, there is the need to know if it has spread out to all parts of the country. In Nigeria, agriculture is being put into practice in different states. The agricultural practices are not majorly large scale; some are small scale or subsistence farming. Therefore to promote this agricultural practice, there is need for the involvement of agriculture innovation and this innovation must be looked into properly so as to view the compatibility of those innovations with productivity. For example, the Kwara State commercial agriculture initiative in Tsonga otherwise known as Zimbabwean farmer's project is the major agriculture project in the state. Apart from the obvious economic and social benefit that has been well documented elsewhere, this initiative has however become a major employer of labor in the state. However, this study will examine the socio-economic characteristics of the sampled farmers in the study area, assess farmers' adoption of new innovation and determine the impact of adoption of innovation on farmers' productivity and income.

Study Area

The study area is Edu Local Government Area of Kwara state lies between Longitude 4° 54' 15" East of Greenwich meridian and latitude 8° 35' 38" North of the equator (Figure 1). Edu Local Government Area has a population of 265,556 (National Population Commission Projection, 2016). The geology of the entire area is made up basement complex rocks that have undergone many processes of metamorphosis and magnetic intrusion. The evidence of agricultural yield in the study area has shown that the soil comprises of loamy, sand and clay soil and their constituents (Olanrewaju, 2012). This however makes it possible for farmers to practice different systems of agriculture such as crop rotation, mixed cropping, mono-cropping, commercial agriculture among others.

The climate of the study area is characterized by the alternation of dry and wet season, each lasting for about six months. The wet season usually starts from the end of March and lasts till October and the dry season commences in November and last till early March. Generally, the climate is characterized by average rainfall which lasts for about six month

April to October). The mean monthly temperature varies from 25°C to 28.9°C but rise up to 29°C in March. The average relative humidity in Edu Local Government Area is about 78.6% and this however varies seasonally because in dry season the relative humidity may be as low as 69.9% (Olanrewaju, 2012). The vegetation of Edu Local Government Area is wood savannah grassland. The common trees available in the study area are locust bean, Shea-butter and shrubs. Grains are grown in the area and the common ones are guinea corn, maize and rice. The economic activities of the people of Edu Local Government Area are dominated by farming activities. This implies that majority of the inhabitant of the local government are farmer.

Material and Methods

The data needed for this study was obtained from both primary and secondary sources in 2013 and revalidated in 2015. This includes data collected from the field using oral interview and questionnaire administration. These are information on the socio-economic characteristic of the respondents (i.e age, sex, marital status, education level, occupation etc), information on the adoption of new innovation such as improved seeds, fertilizer, use of machineries, information on the agriculture innovation and its contribution to increased productivity and information on how the adoption of innovation has impacted lives and income.

Eighty-five (85) copies of questionnaire were administered to registered farmers who were purposively selected in the area. This was to collect all the data relevant for assessing the impact of technological innovation on the farmers in Edu Local Government Area of Kwara State. The data obtained were analyzed using both descriptive and inferential statistics. Descriptive statistics used were tables and charts while inferential statistics (Student t-test) was used to determine the impact of innovation on agricultural production and hypothesis was tested to justify the result obtained.

Results and Discussion

Table 1 shows that 4 respondents [4.7%] are below 40 years and those that are between 40-50 years are 25 respondents [29.4%], 50-60 years are 40 [47.1%] and 60 years and above are 16 [18.8%] respectively. This shows that farmers are in the economic activities age of 40-60. More importantly, majority

of the active population in the area do not stay in the villages. Some of them have travelled to the major towns to look for white collar jobs; some are students in several higher institutions while some have become commercial motorcyclists or mechanics and do not engage in agriculture.

Table 1: Age Distribution of Respondents

Age	Frequency	Percentage [%]
Below 40 years	4	4.7
40-50 years	25	29.4
50-60 years	40	47.1
60 and above	16	18.8
Total	85	100.0

Table 2 shows the sex distribution of the respondents in the study area. 60 [70.6%] of the respondents are male while 25 [29.4%] are female. This depicts a higher involvement of males in agricultural practices compared to female. Few women that engaged in farming were cultivating in a small scale compared to their male counterparts.

Table 2: Sex Distribution of Respondents

Sex	Frequency	Percentage [%]
Male	60	70.6
Female	25	29.4
Total	85	100.0

Figure 1 indicates that primary education is 60 [70.6%] and it is the highest educational qualification of the most farmers. Secondary education is 15 [17.6%], higher education is 8 [9.4%] and the farmers with no education are just 2 [2.4%]. This indicates that most of the farmers have some level of education thus they can be easily approached by extension agents who will help them on their farms and also they can adopt new farming techniques by reading about it. Table 4 depicts that farmers using human skill for production are 55 [64.7%]. This indicates a high proportion in the use of manual labour and crude implements on the farm. This has reduced to unthinkable low output of production in the area as human skill is a bit slow and the land area that can be covered is small. Those who use a form of mechanization are 30 [35.3%]. This reveals that agricultural innovation is gradually being adopted by local farmers.

Table 4: Sources of Labour for Agricultural Production

Source of labour	Frequency	Percentage [%]
Machine	30	35.3
Human skill	55	64.7
Total	85	100.0

Figure 1: Educational Qualification

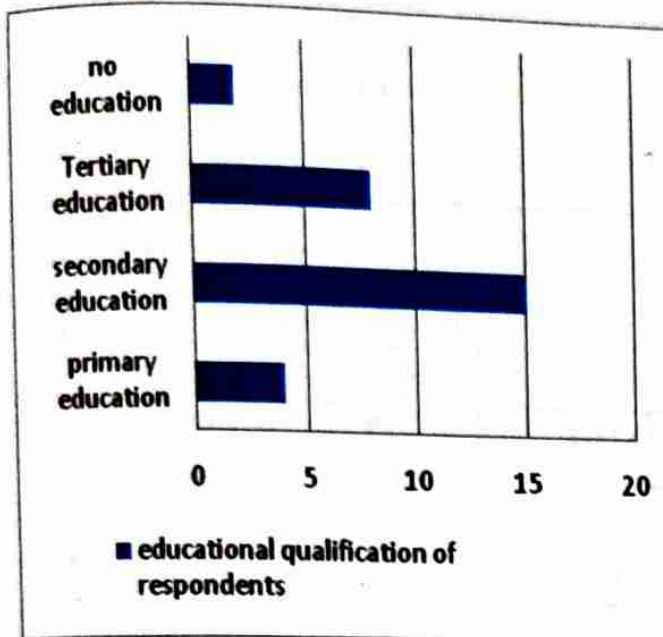


Table 5 shows the impact of innovation on agricultural production in the study area has been greatly felt, resulting to high yield of agricultural produce. When farmers were asked about the impact of innovation on their productivity, 53 [62.4%] reported high impact of innovation on their productivity, 5 [5.8%] believes that its impact is moderate while 2 [2.4%] felt the impact of innovation is low (see Table 5). About 25 (29.4) had never adopted innovation on their farm

Table 5: Impact of innovation on P roductivity

Impact level	Frequency	Percentage [%]
High	53	62.4
Moderate	05	5.8
Low	02	2.4
No adoption	25	29.4
Total	85	100.0

This is due to the fact that some farmers are still conservative. The implication of high impact is as a result of innovative nature of the farmers.

From Table 6, about 60 [70.6%] of the respondents said the negative impact innovation adoption has on their farm is their being too expensive. 13 [15.3%] indicated that they felt it accelerated erosion and 12 [14.1%] said it decreased their productivity. From this, we can agree that the major problem that hinders the adoption of innovation by farmers is lack of capital or financial problem.

Table 6: Negative Impact of Adopting New Technique

Negative impact	Frequency	Percentage [%]
Too expensive	60	70.6
Accelerate erosion	13	15.3
Decrease productivity	12	14.1
Total	85	100.0

From Table 7, about 55 [64.7%] admitted the adoption of innovation has increased the yields of the crops, this is due to the fact that they practice their agriculture so the use of machine, fertilizer and new seeds helps them to work faster and yield high productivity, also 5 [5.9%] said that innovation decreases the yield of their farm produce, this is due to the fact that they have small farm lands and the use of machines and fertilizers will only make them spend more than they will harvest. About 25 (29.4%) did not indicate any response.

Table 8 also reveals that the number of respondents that said innovation has a high impact on their income is 54 [63.5%], this shows that a high percentage of farmers have a positive impact of innovation on their farmland, and thereby increases their standard of living.

Then 5 [5.9%] of the respondents said that they have a moderate impact of innovation on their income and lastly 25 [29.4%] of the respondents said that innovation has low impact on their income.

Table 7: Effects of using new seeds, fertilizer and machine on the farm

Effects	Frequency	Percentage [%]
Increase in yields	55	64.7
Decrease in yield	5	5.9
No response	25	29.4
Total	85	100.0

Table 8: Impact of Innovation on Income

Impact level	Frequency	Percentage [%]
High	54	63.5
Moderate	5	5.9
None	25	29.4
Total	85	100.0

Effect of Agricultural Innovation on Agricultural Yield/Income

Student t-test analysis was employed to determine the effect of agricultural innovation on

yield/income and Table 9 revealed that innovation has contributed effectively to high agricultural productivity in the study area. Considering the use of new seeds, fertilizer application and machinery

Table 9: Student T-test Analysis

	Test Value = 0			Mean Difference	95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)		Lower	Upper
Techniques	1.950	2	.190	28.33333	-34.1828	90.8494
Negative	1.968	2	.188	28.00000	-33.2026	89.2026
Positive	1.789	2	.215	28.33333	-39.8033	96.4700
Productivity	2.117	2	.168	28.33333	-29.2501	85.9168

on farm, T-test was 1.950 with table value of 0.190. The positive impact of innovation on productivity showed a 't' value of 2.117 with table value of 0.168 while adoption of new technique gave a t-test value of 1.968 with table value of 0.188. Innovation and income of the people revealed t-test of 1.789 with table value of 0.215 respectively. This implies that innovation has significant effect on agricultural production. However, the values from the t-test calculations from all responses are greater than the value obtained from the table including new seeds, fertilizers and machines ($1.950 > 0.190$), innovation and productivity ($1.789 > 0.215$), adoption of new techniques ($1.789 > 0.215$) and innovation and income ($2.117 > 0.168$). The implication of this result is that the null hypothesis (continuous adoption of new agricultural techniques does not have significant impact on agricultural yield/income) is rejected and alternative hypothesis (continuous adoption of new agricultural techniques has significant impact on agricultural yield/income) is accepted.

Hence, the adoption of innovation in agricultural sector should be encouraged because of the positive impact it has on agricultural development in the study area. Doss (2003) was in consonance with this finding that subsequent use of innovations occurs at the same scale and adoption is treated as a discrete state. Farmers in the area had

fully adopted the new techniques which directly enhanced a high level of productivity to them. Gebremedhin and Swinton (2003) also support this finding when they opined that other innovations such as new crop varieties, new planting practices, new livestock treatments or micro-irrigation may be first used at a scale smaller than the entire enterprise and subsequently used more extensively which all contribute to productivity

Conclusion and Recommendations

When agriculture is practiced with the use of innovations, it has a tremendous impact on the people ranging from increase in food provision to the supplementary role in the income of peasant farmers. Agricultural innovation has been a weapon for increased agricultural productivity beyond measures. Innovation has increased food output in tonnage per year and impacted farmers well being positively.

This study therefore recommends that the government should encourage the adoption of agricultural innovation which is a more potent approach to improve agricultural productivity among local farmers. Other incentives such as loans should be given to farmers. These would serve as ancillaries to productivity. Agricultural extension programs should be made more effective

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