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INFLUENCE OF AGRICULTURAL EXTENSION SERVICES ON FARMERS' ADOPTION OF AGRICULTURAL TECHNOLOGY AND INNOVATIONS FOR FOOD SECURITY IN BAUCHI STATE, NIGERIA

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ABSTRACT

Agricultural extension plays a vital role in the transfer and dissemination of agricultural technologies and innovations among farmers. The need for extension services became very necessary in order to provide farmers with information that can solve widespread agricultural problems. This study determined the influence of agricultural extension service on farmer's adoption of agricultural technological innovation for food security in Bauchi state, Nigeria. Descriptive survey design was adopted for the study. The researcher sampled 500 farmers that registered with Bauchi State Agricultural Development Programme in Bauchi State out of 64,624 for data collection. The instrument for data collection was 4-points scale structured questionnaire titled Agricultural Extension and Farmer's Technological Adoption (AEFTA). Pilot test was conducted using 50 registered farmers in Plateau state. A Cronbach's alpha reliability coefficient of 0.88 was obtained. Data were collected and entered into Statistical Package of Social Science version 25 for analysis. Mean scores and standard deviations were used to answer the research questions and Linear Regression (LR) was employed in the test of research hypotheses at 0.05 level of significance. The result of the study indicated that the services of agricultural extension agents have significantly influences on acceptability and utilization of technological innovation for food security in Bauchi State, Nigeria. It was concluded that the services of extension agents have been very effective on farmers' adoption of technology for food security in the state. It was recommended among others that Extension Agents should provide orientation programme that would educate farmers on the benefits of adopting modern agricultural technologies for food security in Bauchi state.

Keywords: Agricultural Technology, Adoption, Acceptability, Extension Services, Utilization.

Introduction

Agriculture contributes significantly to the economic development of Nigeria. It contributes significantly to economic development of any nation, promotes food security and provides employment opportunities for people. Despite the importance of agriculture to individuals and nation at large, Abdul (2013) reported that agricultural production in Nigeria faces many hindrances and challenges such as poor agricultural practices, inefficiencies information delivery and lack of information on the use of best agricultural practices. Oluwaseun and Trudy, (2014) showed some of the factors associated with the prevalence and continued low agricultural output in Nigeria as inability of

farmers to adopt modern agricultural technologies as the global demand for food is increasing. Mendel (2016) reported that Agricultural production in recent years is below the regional average food demand. To address all these problems in Nigeria, the government of Nigeria both Federal and State Governments established agency named Agricultural Extension Service which is responsible for assisting farmers through adoption of technological innovations that will help to improve farming methods, food production efficiency and food security. Rahim (2010) defined Agricultural extension as an ongoing process of disseminating new information or innovations to farmers and assisting them to acquire knowledge and skills to use effectively new technology to increase productivity.

Technology adoption by farmers is the major function played by extension service. Loevinsohn et al. (2013) defined technology adoption as an integration of a new technology into existing practice. Challa, (2013) reported that the need to increase agricultural productivity to meet expected rising demand for food availability necessitates the increase for modern technology adoption. Okafor (2017) emphasized the adoption of the new technology in the areas of tools, equipment, agrochemical, management skills and other processes. The importance of adoption of technology and new innovations on food security cannot be over emphasised, but studies have shown that there is low adoption of technology among farmers in Nigeria. The Farmers' adoption of technology in Nigeria is bedevilled by several problems such as adherence to traditional practices, inadequacy and lack of funding, insufficient and inappropriate agricultural technologies for farmers, disproportionate extension agent.

Literature Review

Idoko (2014) carried out investigation on challenges facing groundnut production and adoption of groundnut production technology information packages among women farmers in Taraba state, Nigeria. A multi-stage sampling procedure was used and a total of 200 farmers were interviewed. Data collected were analysed using descriptive statistics, stepwise regression analysis as used to identify socio economic, demographic, institutional and institutional factors that influence the adoption of certified seeds, use of insecticides, storage and harvesting techniques among the women farmers. The result showed that most of the respondents are married, fulltime farmers and are fairly educated. The factors such as household size, marital status, source of information, age primary occupation, land tenure status and correct use fertilizer dosage significantly influenced adoption of certified seeds, use of insecticides, storage and timely harvest among the farmers. Groundnut farmers also indicated that lack of credit facilities, high cost of improved seed and unavailability of technical know-how, lack of fertilizer are factors that limits their production. The study recommends the need to enhance access to improved varieties, bio-pesticides, harvesting and processing techniques, credits and farm input for groundnut producers.

Uguru *et al.*, (2015) assessed the level of acceptance/adoption of agricultural innovations by farmers in Udenu Local Government Area of Enugu State. Farmers from 5 communities and 10staff of 2 agricultural Research Institutes in the study

area were randomly selected as the major population for the study. The instrument used to collect data were structured questionnaire and scheduled interviews. Alternate Hypothesis set for the study were tested using Chi-square at 0.05 probability level of significance and at 4 degrees of freedom; and only one was rejected out of the three hypothesis tested. Result from the study showed that services of extension agents in the rural areas are inadequate and ineffective.

Noah and Abidoye (2019) conducted investigation on the effectiveness of agricultural extension service to improve food production in Nigeria. The objective of this study examined the impact of agricultural extension services on food production in Nigeria. Primary data was collected through the use of questionnaire from farmers in Oshin, Oke-Oyi in Ilorin, Kwara State, Nigeria. The data collected were analysed by the use of descriptive and inferential statistics (Multinomial Logit Model (MLM)). The results show that most of the farmers under the Oshin Irrigation scheme admitted that the scheme has greatly improved their farm outputs and also reduced their cost of production. The study recommended availability and accessibility of credit facilities to farmers, acquiring more modern farm implements and other inputs towards increased productivity.

Research Method

The design for the study was descriptive survey research design. Bauchi State is located in North-East Nigeria. It consists of 20 Local Government Areas and occupies a total land of 49,119 square kilometres (5.3% of Nigeria's total land mass). The state is bordered by seven states, Kano and Jigawa to the north, Taraba and Plateau to the south, Gombe and Yobe to the east and Kaduna to the west. It is located at latitude 9º 3' and 12º 3' and longitude 8º 50'.The target population will be 64,624 farmers that registered with Bauchi State Agricultural Development Programme in Bauchi State. 500 farmers were randomly selected from the population across the Local Governments Areas of Bauchi State. Face to face delivery method was employed in the administration and collection of instrument. This method was considered appropriate because it afforded higher percentage return of properly completed questionnaires. The data collected from the study were entered into Statistical Package of Social Science version 25 (SPSS. 25). The package was used to run descriptive statistics. Mean and standard deviation was used to analyse and answer research questions. The decision rule for the research questions was based on lower and upper class limit of 0.5 – 1.49, Strongly disagreed; 1.50-2.49, Disagreed; 2.50-3.49, Agreed; and 3.50 and above, Strongly agreed. The hypotheses were tested using inferential statistics of Simple Linear Regression at the 0.05 level of significance. The decision rule for the retaining or rejection of hypothesis was based on p-value of 0.05. Thus, where the p-value was less than 0.05 level of significance, the hypothesis was rejected, and where the p-value was equal to or greater than 0.05 level of significance (0.05), the hypothesis was retained.

Result and Analysis

Research Question One: What is the influence of Agricultural Extension Service on farmers' acceptability technological innovation for food security in Bauchi State, Nigeria?

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The mean scores of the items used to answer research question one is presented in Table 1 below and ranges from 1.32 (Strongly Disagreed) to 3.74 (Strongly Agreed). The standard deviations stood at 0.33 and 0.93 respectively. The grand score was 2.63 (Agreed) with standard deviation of 0.57. The Cluster mean obtained suggested that Farmers agreed with the items on Acceptability technological innovation (FATIs) or food security in Bauchi State, Nigeria. The test of null hypothesis one in Table 2 was used to ascertain the influence of Agricultural Extension Service on farmers' acceptability technological innovation for food security in Bauchi State, Nigeria?

Table 1: Descriptive statistics on influence of AES on FATIs for food security in Bauchi.

S/no	Statement	Mean	Std. dev	Remark
1.	The use of technologies increases farming output	2.72	0.68	Agreed
2.	New technologies do not improve the quality of produce	2.55	0.64	Agreed
3.	The use of technology helps farmers in storing farm produce.	2.92	0.73	Agreed
4.	Agricultural technologies encourage cultivation of more farmlands by farmers	2.07	0.52	Disagreed
5.	I use agricultural technology for my farming activities.	3.74	0.93	Agreed
6.	New technology do not have effect on food production and preservation	3.30	0.83	Agreed
7.	New technology did not improve the quality of my produce	1.32	0.33	Disagreed
8.	The use of technological innovation such as silos or cribs helps in storage of grain	1.84	0.46	Disagreed
9.	Agricultural technology encourage cultivation of more farmlands by farmers	2.71	0.68	Agreed
10.	The use of new innovations such as harrowing, farrowing and geographical information system has tendency of improving crop production	3.08	0.77	Agreed
	Cluster mean	2.63	0.59	Agreed

Source: Fieldwork, 2023

Result of Hypothesis Test: Agricultural Extension Service has no significant influence on farmer's acceptability of technological innovation for food security in Bauchi State, Nigeria.

The finding of null hypothesis four presented in Table 2 revealed the Standardized Coefficients Beta of .185 with t-value of 4.034. The R-value was 137 and R Square stood at .019. The obtained R Square indicated that AES had 1.9% influence on farmer's adoption technological innovation FATIs for food security in Bauchi State, Nigeria. This is also seen in p-value of .000 which was less than the alpha value of 0.05. The result indicates that the influence of AES on FATIs for food security in Bauchi state was significance. The hypothesis was not retained.

Table 2: Regression analysis on influence of AES on FATIs for food security.

Standardized Coefficients Beta	T	R	R Square	Adj. R Square	p-value	Remark
.185	4.034	.137[a]	.019	.017	.000	Rejected

Source: Fieldwork, 2023.

Research Question Two: What is the influence of Agricultural Extension Service on farmers' utilization technological innovation for food security in Bauchi State, Nigeria?

The findings of research question two documented in Table 3 revealed mean scores ranges from 1.82 (Disagreed) to 3.35 (Agreed) with standard deviations of 0.45 and 0.84 respectively. The Cluster mean score of the items was 2.61 (Agreed) with the standard deviation of 0.59. The Cluster mean score attained suggested respondents agreed with the items on Farmers' Utilization technological innovation (FUTIs) for food security in Bauchi State, Nigeria. For the influence of Agricultural Extension Service on farmers' utilization technological innovation for food security in Bauchi State, Nigeria, test of hypothesis two in Table 4 should be consulted.

Table 3: Descriptive statistics on influence of AES on FUATIs for food security in Bauchi.

S/no	Statement	Mean	Std. dev	Rmk
1.	Through the use of technological innovation, improve adoption of agricultural technologies	2.73	0.68	Agreed
2.	I do use improved varieties on my farm.	2.50	0.63	Agreed
3.	The use of a knapsack sprayer by farmers is common	2.90	0.72	Agreed
4.	Ploughing and ridging before planting	3.17	0.79	Agreed
5.	I use agrochemicals such as herbicides, pesticides on my farm for improved production	2.09	0.52	Disagreed
6.	Agricultural Extension Agents in my area are not easily available and accessible	2.07	0.52	Disagreed
7.	Integrated pest management is usually done by farmers	3.35	0.84	Agreed
8.	Structural factors such as size of farm hinders technology usage in my area	1.82	0.45	Disagreed
9.	The population of extension agents in my area is inadequate	3.11	0.78	Agreed
10.	New technologies can help me to acquire better skills to improve farming activities	2.42	0.61	Disagreed
	Cluster mean	2.61	0.57	Agreed

Source: Fieldwork, 2023

Result of Hypothesis Test: Agricultural Extension Service has no significant influence on farmer's utilization of technological innovation for food security in Bauchi State, Nigeria.

The test of null hypothesis two documented in Table 4 present the value of .137 for Standardized Coefficients Beta with t=2.955. The R-value obtained was .183 with R-Square of 0.33. The value of R Square shows that AES had 33% influence on the farmer's utilization technological innovation (FUTIs) for food security in the study area. The p-value was found to be less than the alpha value (.000<0.05), the result indicated that AES had significant influence on FUTIs. The hypothesis was therefore rejected.

Table 4 : Regression analysis on influence of AES on FUTIs for food security

Standardized Coefficients Beta	T	R	R Square	Adj. R Square	p-value	Remark
.137	2.955	.183[a]	.033	.031	.003	Rejected

Source: Fieldwork, 2023

Summary of the Findings

(1) Agricultural Extension Services have significant influence on farmers' acceptability technological innovation for food security in Bauchi State, Nigeria.

(2) The influence of Agricultural Extension Services on farmers' utilization technological innovation for food security in Bauchi State, Nigeria was significant.

Discussion of the Findings

Results of research null hypothesis one revealed that Agricultural Extension Services have significant influence on farmers' acceptability technological innovation for food security in Bauchi State, Nigeria. The result was found to be similar with that of Robertson (2012) who reported that Extension workers have an extensive knowledge of various agricultural disciplines and they should have the ability to deal with farmers and persuade them to accept modern agricultural techniques and ideas so as to use them on their farms. The author added that Agricultural extension brings about changes, through education and communication in farmers' attitude, knowledge and accept the use of modern technology for bomber harvest. Tai (2012) also reported that after extension workers transfer of agricultural technologies to farmers, which is based on their needs for those techniques, they also convince them to accept these new agricultural techniques for food sustainability. The author further argued that, it is the responsibility of people working in the agricultural extension to persuade farmers to embrace the new technology and agricultural technology processes.

The study of Abd (2013) also reported that agricultural extension is aimed at transfer of agricultural technology and for persuading farmers to accept and use these technologies on their farms, because farmers need those new and modern technology to increase agricultural

production in various types of agricultural crops and the quantities and qualities of consumer goods on the market. Yahya and Xiaohui (2014) confirmed there is positive correlation between the service provided by extension workers and adoption of technology for food production in Nigeria. A study conducted in four regions of Ethiopia show that farmers who had more frequent contact with extension agents were more likely to adopt wheat technology as compared to farmers who had low frequent contact (Tefera et al. 2016).

The analysis of research hypothesis two shows that Agricultural Extension Services significantly influence farmer's utilization technological innovation for food security in Bauchi State, Nigeria. The result agrees with that of Anaeto, (2012) who opined that agricultural extension service assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, and bettering their levels of living as well as uplifting the social and educational standards of rural life. Adejo and Okwu (2012) opined that the service provided by agricultural extension workers on advice and assistance given to farmers and their families through educational procedures on new farming methods and techniques in order to improve their production and income, bettering their level and uplifting the education and social standard of the farmers promotes food security in the country. The farmers' field school, which is just introduced is still under incubation; it is the participatory approach extension service that enhance utilization of technological innovation for food security (Hamisu et al., 2017). The authors maintained that extension services provide assistances for agriculture and rural development, cooperative extension, advisory services, technology transfer, as well as the transfer and exchange of practical information and utilization of technology for food sustainability.

Conclusion

The study has presented empirical evidence on the influence of Agricultural Extension Service on farmers' adoption of technological innovation for food security in Bauchi state, Nigeria. The services provided by extension agents have influence on farmer's technological acceptability and utilizations of technological innovation in Bauchi state. These therefore shows that service provided by Agricultural Extension agents have potential educating farmers on the need to use modern technology. It is therefore concluded that the services of extension agents in Bauchi state have been very effective on providing farmers with needed skills and understanding for accepting and adoption of technology for food security in the state.

Recommendations

The study recommended that:

(i) Agricultural Extension Agents should encourage farmers to form cooperatives and public awareness programme that will facilitates their service delivery on providing farmers with skills for utilization of modern agricultural technology in Bauchi state.

(ii) Agricultural Extension Agents should concentrate on educating farmers on the benefits of adopting modern agricultural technologies for food security in Bauchi state.

(iii) Agricultural Extension Agents should intensify their service delivery by organizing training section to farmers on how to use modern agricultural technology for food security in Bauchi state.

(iv) Bauchi state government through ministry of agriculture should continue to strengthen agricultural extension agents that will encourage them to discharge their duties of educate farmers on importance of utilization of modern agricultural technology for food security in the state.

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