

Influence of Demographic Variables on Crop Farmers' Adoption of Agricultural Technology in Gombe State

GARBA Sadiq Abubakar¹, DANKADE Umar¹, HABU, Bamusa Kwami², BAPPAH Njidda³ & ABDULLAHI Usman³

¹Department of Vocational and Technology Education, Abubakar Tafawa Balewa University Bauchi

²Department of Science Education, Federal University Kashere, Gombe

³School of Vocational Education, Federal Collage of Education (T), Gombe

Corresponding Author: garbasa01@gmail.com

Abstract

The study determined the influence of demographic variables on crop farmers' adoption of agricultural technology in Gombe State. Three specific objectives which are in line with three research questions and three null hypotheses were formulated to guide the study. A Descriptive Survey Design was used for this Study. The population of the study comprises all the 22,682 registered crop farmers in Gombe State as at 2020 farming season. A total of 320 crop farmers out of the entire population formed the sample size of the study; they were selected using multi-stage sampling technique. A 6 item structured questionnaire was used in collecting data. The data collected were analysed using both descriptive statistics of mean and standard deviation to answer research questions, while simple linear regression was used to test the null hypotheses at 0.05 level of significant. The result indicated that, male crop farmers adopted agricultural technology faster than their female counterparts; also farmers' adoption of technology is proportionate to their level of educational qualification. More so, the result showed that membership to cooperative society influenced crop farmers' adoption. However, all the corresponding null hypotheses were rejected, as there was a significant positive influence of the variables under study on crop farmers' adoption of agricultural technology. It was concluded that, gender, education level and membership to cooperative society had significant positive influence on crop farmers' adoption of agricultural technology. It was recommended that, State Governments should increase awareness campaign programme for educating crop farmers, so as to improve their level of adoption of agricultural technology.

Key words: Influence, Demographic Variable, Crop Farmers, Adoption and Agricultural Technology

Introduction

Globally, agriculture plays a significant role on food security, economic development, and poverty alleviation in any country. In agreement, World Bank (2018) reported that agriculture play essential role in addressing extreme poverty and hunger. Despite the importance of agriculture, studies have shown that Nigerian's agriculture is characterized by smallholder farmers who are poor, cultivate small land area and have little or no access to inputs and credit (Loevinsohn *et al.*, 2013). Akinola and Owombo (2012) further affirmed that, the farm harvest of most Nigerian farmers is small as a result of resistance to adoption of new technology. Muzari *et al.*, (2012) argued that farm yield of Nigerian farmers is generally very low, because most of them use local input and process. Accordingly, Abdul (2013) reported that, agricultural production in developing countries face many interruptions and challenges such as poor agricultural practice, inefficiencies in information delivery, and lack of information on the use of best agricultural practices among farmers (Nigeria inclusive). By implication, the research evidences show that one of the

factors related to the occurrence and continued low agricultural output in the country is the farming practices. Consequently, Oluwaseun and Trudy (2014) reported that Nigeria will continue to face food deficit as a result of traditional methods adopted by farmers in the process of production.

Over 70 percent of Gombe state population engages in the agronomy sector mainly at a subsistence level (Ogbonna & Nwaobiala 2014). Despite the contribution of the sector to the economy, Gombe State agricultural sector faces many challenges apart from adoption of agricultural technology which affect productivity. These may include; non-adoption of innovation, poor land tenure system, low level of irrigation farming, climate change and land degradation. In addressing the above prevailing situations, stakeholders in agriculture should emphasize on adoption of technological innovations.

Agricultural technology is the process whereby individuals or organizations bring new or existing products, processes or ways of organization into use for the first time in a specific context in order to increase effectiveness, competitiveness, resilience to shocks or environmental sustainability and thereby contribute to food security and nutrition, economic development or sustainable natural resource management (FAO, 2018a).

The importance of technological innovation according to Okunlola, *et al.*, (2011) includes production of high-quality products and services with less human resource. In agriculture, technology refers to the use of techniques and practices to promote agricultural output. The importance of technology on food security and poverty alleviation among farmers triggered scholars such as Loevinsohn *et al.*, (2013) to emphasize the adoption of the new approaches in the areas of tools, equipment, agro-chemical, management skill, and other processes. There is, therefore, a rising momentum in policies that are targeted at improving the rate of agricultural technology adoption by farmers, especially women in rural Africa (Lawal, Okeh & Uguru, 2016). International Fertilizer Development Centre IFDC, (2016). Such low rate of adoption of agricultural technology, particularly among women, can be potentially traced to poor finance, lack of access, and lack of knowledge of farmers regarding these technologies. In recent years, Nigeria has implemented an agricultural promotion policy that targets agricultural sector sustainability and rural development by 2020. This ambitious policy is also targeted at enhancing the adoption of agricultural technology among farmers in general and women in particular. Decrease in the adoption of agricultural technology by women may continue to pose as a threat to food consumption, nutrition outcomes and productivity in rural Nigeria (Atata 2020). More attention needs to be paid to agricultural technology adoption as a viable option to improve the food security, income and the welfare of mostly rural households whose livelihoods largely depend on their agricultural activities.

The demographic characteristics of crop farmers may influence their adoption of technology positively or negatively which may result to either high or low productivity of most crops, even if all other factors of production remain constant. Researchers have examined determinants of technology adoption in other places. For example, study conducted in Kenya by Mwangi and Samuel, (2015) indicates that factors determining adoption of new technology in developing countries includes farm size, poverty, educational level, cooperative membership and reliability of the information. Similarly, study conducted in the Southern parts of Nigeria suggested low level of education affects adoption of agricultural technology among crop farmers (Kudi *et al.*, 2011). They further stressed that education level of farmers; access to extension service; farm size and gender have significant and positive influence on technology adoption. Okunlola, *et al.*, (2011) maintained that educational level and cooperative membership are the major factors that determine the adoption of new technology among small scale farmers in Delta State Nigeria. Empirical evidences have shown none of these studies was conducted in Gombe state this urged the researcher to carry out this study to fill the existing gap.

Statement of the Problem

In Nigeria, agriculture may be among the sectors that have been receiving significant proportion of federal and state government budget. Under the Buhari administration, budgetary allocation for agriculture rose from 1.70 per cent in 2017 to 2.00 per cent in 2018, fell to 1.56 per cent in 2019, and 1.34 per cent in 2020, before recording an increase to (2.37 per cent) in 2021 (Obinna, 2021). More so, Gombe State government declared a state of emergency on agriculture in 2021 (Muhammad, 2021). Despite the huge amount of money invested in agriculture in recent administration, food security has not been attained

optimally (FAO, 2018). Significant portion of the Nigerian population have been facing problem of chronic food insecurity which is associated to the use of traditional farming practices (FAO, 2013). Oluwaseun and Trudy (2014) indicates that significant numbers of people were chronically undernourished as a result of low adoption of agricultural technological innovation. The rate of vulnerable children, malnutrition, starvation and dependency associated to poverty and food insecurity in North East Nigeria is alarming, including Gombe State (FAO, 2018). The report further revealed that more than 44% of the population in North-East Nigeria is undernourished. However, there are many innovations that can improve the productivity of our crops when put in place, but majority of farmers in Gombe State fail to adopt and still use predominant methods in agricultural activities. Similarly, Ezeano (2010) reported that factors related to the adoption of improved farm practices include farmer capital, education level, years of experience, gender, membership, social and agro-climate. Considering the above-mentioned variables as determinants of adoption of technology in some areas, since the available literature showed that, there was little or no study of this kind that was conducted in Gombe State. Therefore, this is what prompted the researchers to carry out a study on the stated topic, so as to bridge the gap of none existence or add more literature to the existing in the study area. The result of this study will equipped the crop farmers' with necessary information on the influence of demographic variable on agricultural technology adoption. Specifically, the study seeks to:

1. determine the influence of gender on crops farmer's adoption of agricultural technology;
2. investigate the influence of educational qualification on crops farmer's adoption of agricultural technology and
3. examine the influence of cooperative membership on crops farmer's adoption of agricultural technology in Gombe State.

Research Questions

In line with the stated objectives, the study intends to answer the following research questions

1. What is the influence of gender on crop farmers' adoption of agricultural technology in Gombe state?
2. What is the influence of educational qualification on crop farmers' adoption of agricultural technology in Gombe state?
3. What is the influence of cooperative membership on crop farmers' adoption of agricultural technology in Gombe state?

Research Hypotheses

The following hypotheses guided the study

HO₁: Gender has no significant influence on crop farmers' adoption of agricultural technology in Gombe state, Nigeria

HO₂: Educational Qualification has no significant influence on crop farmers' adoption of agricultural technology in Gombe state, Nigeria

HO₃: Cooperative membership has no significant influence on crop farmers' adoption of agricultural technology in Gombe state, Nigeria

Methodology

A Descriptive Survey Design was used for this study. The researchers found the design appropriate because the current study deals with collecting data from a sample for the purpose of generalisation. The population of the study comprised all the 22,682 registered crops farmers in Gombe State as at 2020 farming season (GSADP, 2020). A total of 320 crop farmers out of the entire population were selected using Morghan Table of sample size determination. Multi-stage sampling technique was used in selection of the respondents for the study. Firstly, two (2) agricultural zones were purposively selected out of the three (3) agricultural zones in the State that is central and western agricultural zones, due to the intensity of crop production in the two zones. Secondly, four (4) sub- zones were randomly selected from the six sub- zones in the two selected zones in the State. Thirdly, the entire 32 extension blocks from the four (4) sub- zones selected were used. Finally ten (10) respondents were randomly selected from the 32 extension block, making a total of 320 crop farmers were used in the study. 6-item structured questionnaires which developed by the researchers and validated by experts were used for data collection. It contained two sections, the demographic variables of the respondents and the questionnaire items. The instrument was administered by the researchers with the help of four trained research assistants. The data collected were coded and analysed using both descriptive statistics of mean and standard deviation to answer research questions, while simple linear regression was used to test the null

hypotheses at 0.05 level of significant. For any mean equal to or greater than 2.50 was consider agree, while for any mean less than or equal 2.50 was consider disagree.

Results and Discussions

Research Question One

The analysis of data used to answer research question one is presented in Table 1. The result presented mean for gender categories of the respondents. The result revealed that, the mean scores of the six items for the female respondents, ranges between 2.11 to 2.42, with a grand mean of 2.31, which represents disagreement. However, the mean scores of male respondents in all the six items range between 2.71 to 3.43 with a grand mean of 3.07, representing an agreement. This indicates that, male crop farmers adopted agricultural technology faster than their female counterparts in Gombe State. Similarly, the finding of this study is in line with the findings of Mignouna *et al.*, (2011) who asserted that gender affects technological adoption since the head of the household is the primary decision maker, and men also are the final decision maker in a house due to cultural values or norms. The finding also concurs with that of Lavison (2013), who opined that male farmers were more likely to adopt organic fertilizer unlike their female counterparts.

Table 1: Mean score of Farmers' adoption of technology based on their gender

S/N	ITEMS	1	0
1	Crop farmers are curious on how to operate new innovations in their farm	2.71	2.11
2	Gender bias is a serious problem in adopting new technology in our area	3.21	2.40
3	I used new innovation immediately when received to improve my farm output	3.35	2.42
4	Crop farmers seeks the company of extension works who always assist in adopting new innovations	2.78	2.34
5	Crop farmers regularly look for improve agricultural products as their inputs	3.43	2.31
6	Crop farmers learn how to cope with the new innovation in my farm	2.99	2.26
	Grand Mean	3.07	2.31

Source: Field Survey (2021). Note: 1=Male, 0=Female

Research Question Two

The analysis of data used to answer research question two is presented in Table 2. The result presented mean of the four groups of respondents based on their level of education. From the Table 2, the result revealed the mean scores of all the six items under farmers with No formal Education range from 1.09 to 2.04, which represents disagreement; while the mean scores of farmers who attended primary school ranged between 2.21 to 2.78 (disagree). Also, farmers who attended secondary school, had mean scores range between 2.81 to 3.21, representing an agreement. More so, farmers who attended tertiary institutions had mean scores range between 3.31 to 3.78, representing an agreement. Therefore, this indicates that farmers' adoption of technology is proportionate to their level of qualification. This implied that, the higher the education level of a farmer, the faster he adopts agricultural technology. The result indicated that level of education determines farmers' adoption of agricultural technology in Gombe state. The finding concurs with the findings of Lavison (2013) who reported that the level of education of a farmer has been classified as one of the elements of technological adoption.

Table 2: Mean score of Farmers' adoption of technology based on their education level

SN	ITEMS	1	2	3	4
1	Crop farmers are curious on how to operate new innovations in their farm	1.09	2.21	2.81	3.78
2	Gender bias is a serious problem in adopting new technology in our area	1.07	2.52	2.96	3.31
3	I used new innovation immediately when received to improve my farm output	1.42	2.67	3.21	3.45
4	Crop farmers seeks the company of extension works who always assist in adopting new innovations	1.62	2.78	2.87	3.67
5	Crop farmers regularly look for improve agricultural products as their inputs	2.04	2.67	3.12	3.61
6	Crop farmers learn how to cope with the new innovation in his farm	1.78	2.72	2.88	3.71

Source: Field Survey (2021). Note: 1= No formal edu, 2= Primary edu., 3= Secondary edu., 4= Tertiary edu.

Research Question Three

The analysis of data used to answer research question three presented in Table 3. The result presented mean ratings of the two groups of respondents based on their membership in cooperatives. From the Table 3, the result showed farmers who registered with any organization indicates mean scores which range between 2.75 to 3.45 with a grand mean of 3.11 representing agreement. However, the farmers who did not registered with any organization indicates mean scores which range between 2.13 to 2.46 with a grand mean of 2.34, representing disagreement. This indicates that membership to cooperative society influence crop farmers' adoption of agricultural technology in Gombe State. The finding is in harmony with the finding of Loevinsohn *et al.*, (2013) who found that farmers who participated more in

community-based organisations were likely to engage in social learning about technology, which leads to adoption.

Table 3: Mean score of Farmers adoption of technology based on membership

S/N	ITEMS	1	0
1	Crop farmers are curious on how to operates new innovations in their farm	2.75	2.13
2	Gender bias is a serious problem in adopting new technology in our area	3.11	2.46
3	I used new innovation immediately when received to improve my farm output	3.33	2.42
4	Crop farmers seeks the company of extension works who always assist in adopting new innovations	2.98	2.34
5	Crop farmers regularly look for improve agricultural products as their inputs	3.45	2.33
6	Crop farmers learn how to cope with the new innovation in his farm	2.99	2.36
	Grand Mean	3.11	2.34

Source: Field Survey (2021). Note: 1=Member, 0=Non member

Results of Hypotheses Testing

Null hypothesis one

The statistical evidence in Table 4 revealed the coefficient beta value of .935 with t-value of 3.122. The R-value obtained was .922 and R-Square of .961. The obtained R-Square suggested that the independent variable has 96.1% influence on farmers' adoption of agricultural technology. The p-value of .000 indicated that gender of crop farmers has significant positive influence on their adoption of agricultural technology. The null hypothesis was therefore rejected. This finding is in agreement with the study conducted by Okunlola, *et al.*, (2011) on adoption of technology. The researchers found that gender had a positive significant influence on adoption of improve cassava production in Nigeria.

Table 4: Regression analysis on influence of gender on farmers' adoption of agricultural technology

Model	Coefficients (Beta)	T	R	R Square	Adjusted R Square	Sig.
1	.935	3.122	.922	.961	.961	.000

Source: Field Survey (2021)

Null hypothesis two

The statistical evidence in Table 5 revealed the coefficient beta value of .987 with t-value of 2.774. The R-value obtained was .881 and R-Square of .914. The obtained R-Square suggested that the independent variable has 91.4% influence on farmers' adoption of agricultural technology. The p-value of .000 indicated that educational level of farmers has significant positive influence on their adoption of agricultural technology. The null hypothesis was therefore rejected. The finding of this study disagree with the finding of Ishak and Afrizon (2011) which reported that level of education has no significant influence on farmers' adoption of innovations.

Table 5: Regression analysis on influence of education level on farmers' adoption of agricultural technology

Model	Coefficients (Beta)	T	R	R Square	Adjusted R Square	Sig.
1	.987	2.774	.881	.914	.914	.000

Source: Field Survey (2021)

Null hypothesis three

The statistical analysis in Table 6 revealed the coefficient beta value of .877 with t-value of 3.674. The R-value obtained was .821 and R-Square of .866. The obtained R-Square suggested that the independent variable has 86.6% influences on farmers' adoption of agricultural technology. The p-value of .000 indicated that membership to a society of farmers has positive significant influence on their adoption of agricultural technology. The null hypothesis was therefore rejected. This implied that cooperative members learn from each other the benefit of innovations. The study conducted by Uker *et al.* (2013) reported that membership to agricultural society had significant and positive influences on farmers adoption of innovation.

Table 6: Regression analysis on influence of membership on farmers' adoption of agricultural technology

Model	Coefficients (Beta)	T	R	R Square	Adjusted R Square	Sig.
1	.877	3.674	.821	.866	.866	.000

Source: Field Survey (2021)

Conclusion

Despite the fact that various factors of farmers' socio-economic variables determine the adoption process of agricultural innovations, it was concluded that, gender, education level and membership to cooperative society had significant positive influence on crops farmers' adoption of agricultural technology in Gombe State.

Recommendations

1. The stakeholders in agriculture in Gombe state should contribute to enhancing gender participation on the adoption of agricultural technology.

2. State Governments should increase awareness campaign programme that would educate crop farmers, so that their level of adoption of agricultural technology will improve.
3. Agricultural extension workers and registered crop farmers should advise their colleagues to join farmers' societies or cooperatives as much as they can.

References

- Abdul, R. C., (2013). Information Communication Technology for Agricultural Development *Journal for Tropical Agriculture*, 9 (4) 185-196.
- Akinola, A. A. and Owombo, P., (2012). Economic Analysis of Adoption of Mulching Technology in Yam Production in Osun State, Nigeria. *International Journal of Agriculture and Forestry*, 2(1): 1-6
- Atata S. N., Tanankem V. B., Efobi U. & Orkoh E. (2020). Adoption of Agricultural Technology Productivity and Food Consumption of Households in Rural Nigeria. African Economic Research Consortium (AERC) - October 2020
- Ayinde O. E., Adewumi M. O., Olatunji G. B., & Babalola O. A. (2010). Determinants of Adoption of Downy Mildew Resistant Maize by small-scale Farmers in Kwara State Nigeria. *Global Journal Science Frontier Resources*, 10(1):32-35
- Food and Agriculture of the United Nations (2013). Multiple dimensions of food security Rome: FAO; 2013.
- Food and Agriculture of the United Nations (2018). The State of food insecurity in the world FAO; 2018
- Food and Agriculture of the United Nations (2018a). FAO's work on agricultural innovation: Sowing the seeds for transformation to achieve the SDGs in Nigeria. FAO; 2018
- GSADP, (2020). Expanding the Concept and Addressing Uncertainties, Committee on Expanding enrolment of farmers in Gombe State. Available at: www.tandfonline.com/doi/abs/10.1080/1355
- International Fertilizer Development Centre - IFDC (2016), IFDC Project Charts Way Forward for West African Fertilizer Use, <https://ifdc.org/2016/07/25/ifdc-project-charts-wayforward-for-west-african-fertilizer-use/>
- Ishak, A., & Afrizon. (2011). Perception and adoption rates of farmers on the application of the system of rice intensification (SRI) in Bukit Peninjauan I, Talbot Sub district, Seluma District. *Journal of Agricultural Informatics*, 20(2), 76-80.
- Kudi, T. M., Bolaji, M., Akinola, M. O., and Nasa IDH, (2011). Analysis of Adoption of Improved Maize Variety among Farmers in Kwara State, Nigeria. *International Journal of Peace and Development*, 3(5): 235-247.
- Lavison, R. (2013). Factors Influencing The Adoption of Organic Fertilizers In Vegetable Production In Accra Msc Thesis Accra Ghana. Pp88.
- Lawal, N.I., Okeh, B.I. & Uguru, C. (2016) Influence of Fadama I Project on the Socio-Economic status of Farmers in Kebbi and Sokoto State, Nigeria. *American Journal of Education and Learning*. 6(2) 94-102.
- Loevinsohn, M. Sumberg, J. and Diagne, A., (2013). Under what Circumstance and Condition does Adoption of Technology result in Increasing Agricultural Productivity? Social Science Research Unit, Institute of Education University of London.
- Mignouna, B., Manyoug, M., Rusike J., Mutabazi, S., and Senkondo, M.. (2011). Determinants of Adopting Improved-Resistant Maize Technology and Its Impact on Household Income in Western Kenya: *Journal for Tropical Agriculture*, 14 (3), 158-163
- Muhammadi I. Y. (2021). Revolution in Agriculture for National development. A paper presented at Flagged off sale and distribution of fertilizer for 2021 farming season at ADP unit on 11th May, in Shongom LGA, Gombe State.
- Muzari, W., Gatsi, W. and Muvhunzi, S. (2012). The Impact of Technology Adoption on Smallholders Agricultural Productivity in Sub-Saharan Africa: A Review, *Journal of Sustainable Development*, 5(8): 235-246.
- Mwangi, M. and Samuel, K., (2015). Factors Determining Adoption of New Agricultural Technology by Smallholders Farmers in Developing Country, *Journal of Economic and Sustainable Development*, 5 (6): 208-216.
- Ogbonna, M. O., Nwaobiala, C. U., (2014), Analysis of Poverty Profiles of Participating and Non-Participating Rural Farm Women in Fadama III Development Project in Gombe State, Nigeria. *International Journal of Agriculture and Rural Development (IJARD)* 17(2):1762-1767.

- Okunlola O. Oludare, O. and Akinwalere, B., (2011). Adoption of New Technology by Fish Farmers in Akure, Ondo State, Nigeria. *Journal of Agricultural Technology*, 7(6): 539-548.
- Oluwaseun, K. and Trudy, H., (2014). Impact of cooperative Membership on Farmers Uptake of Technological Innovation in South-West Nigeria. *Development Study Research*, <http://dvr.doi.org.10,10018021665095,2014>.
- Uker D, Zuki M, Dani Y, and Syafnil A., (2013) Adoption of innovation strategy and policy of the system of rice intensification (SRI) in the province of Bengkulu. BOPT Fundamental Research Report
- World Bank. (2018). Getting Agriculture Going in Nigeria. A Framework for National Growth Strategies. Washington, DC: World Bank.