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Impact of Institutional Factors on Adoption of New Practices on Maize Production Among Farmers in Plateau State, Nigeria

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Abstract **Meta-analysis**

The research work is on impact of institutional factors on adoption of new practices for maize production among farmers in Plateau State, Nigeria. The study has two specific objectives, two research questions and two null hypotheses. Descriptive survey research design was used for the study. The population of the study was 154 registered maize farmers in Mangu Local Government Areas. All the 154 registered maize farmers were used as sample. Structured questionnaire was used as instrument for data collection. Face to face method of delivery was used to distribute the instrument with the help of two research assistants. 154 copies of questionnaire were distributed but only 126 copies were duly completed and returned. Frequency and percentages were used to answer research question 1 while mean score and standard deviation were used to answer the research questions 2. Multiple regression statistics was used to test the null hypotheses at significant level of 0.05. It was found that quarterly extension contact, 3 farmers' cooperative/organizations, partial access to credit/loan and subsidized inputs and radio/television station as source of information were the main institutional factors that influence adoption of improved maize production practices by farmers and the influence is statistically significant (.000). The level of farmers' adoption improved use of seeds, land preparation, planting, seed dressing, fertilizer application, herbicides, manual weeding and harvesting is high. Federal government as well as NGOs should intensify institutional factors such as extension contact, credit/loan, farm input, radio/television to influence adoption of improved maize production practices by farmers in Plateau state, Nigeria.

Keywords: Institutional Factors, Adoption, New Practices, Maize Production and Farmers.

Introduction

Adoption of improved agricultural technologies includes all kinds of improved techniques and practices which affect the growth of agricultural output (Jain etal, 2016). According to Lavison, (2017) the most common improved crop production practices for crops include new varieties and management regimes; soil as well as soil fertility management; weed and pest management; irrigation and water management. By virtue of improved input/output relationships, new technology tends to raise output and reduces average cost of production which in turn results in substantial gains in farm

income (Challa, 2015).Adopters of improved technologies increase their productions, leading to constant socio-economic development. Adoption of improved agricultural technologies has been associated with: higher earnings and lower poverty; improved nutritional status; lower staple food prices; increased employment opportunities as well as earnings for landless laborers (Onuk, etal, 2020). The adoption of improved production practices by farmers is faced with or influenced by many factors which include socio-economic characteristics of the farmers, institutional factors and level of awareness of farmers on improved crop production practices (Umar, 2016)

Several factors may have influence on the extent of adoption of farm practices such as characteristics of farm practice; the adopters; the change agent (extension worker, professional, etc.); and the socio economic, biological, and physical environment in which the technology take place. Socio-psychological trait of farmers also plays an important role in technology adoption. The age, education attainment, income, family size, tenure status, credit use, value system, and beliefs are usually positively related to adoption. From the existing literatures it is evident that adoption of technologies in farming practices is affected by certain factors (Ziervogel, 2015; Hansen etal, 2017). Salehin (2019). The farmer's attitude towards change, land, sources of information, membership of farmer's organizations, educational level, farm income, farmer's exposure, and educated male farmers, higher income level, risk orientation and decision making ability of farmers are the important socio-economic factors influencing adoption of improved farm practices (Hansen etal, 2017). Factors limited adoption of technology includes conservative old men, illiterate, weak belief on ensure high yield of new technology etc. So, it is evident that farmers' adoption and use of improved farm practices can be influenced by various socio-economic factors. (Hansen etal, 2017)

Institutional factors that influence adoption of improved crop production practices farmers' participation in social group. Belonging to a social group enhances social capital allowing trust, idea and information exchange (Mignouna etal, 2020). Farmers within a social group learn from each other the benefits and usage of a new technology. Uaiene and Masters (2019) suggests that social network effects are important for individual decisions, and that, in the particular context of improved agricultural practices, farmers share information and learn from each other. Acquisition of information about a new technology is another factor that determines adoption of technology. It enables farmers to learn the existence as well as the effective use of technology and this facilitates its adoption. Farmers will only adopt the technology if they are aware of or have heard about it. Access to information reduces the uncertainty about a technology's performance hence may change individual's assessment from purely subjective to objective over time.

Statement of the Problem

Researcher's observation and interactions with some maize farmers revealed that many factors play significant roles in adopting the new maize farming practices but for the purpose of this research study, the researcher intends to examine institutional factors and farmers awareness level as they affect use of new maize farming practices. It is evident that a number of studies have been conducted across the world on technology adoption, but there is dearth of literature on the specific factors that influence adoption of improved maize farming practices, especially among farmers in Plateau state of Nigeria. This is a gap that must be bridged if the problem of low technology adoption among farmers is to be addressed and agricultural productivity is to be improved. Therefore, there is a necessity to address the factors influencing adoption of new maize farming practices to ensure stable supply of maize crop all year round. Owing to this necessity this study is aimed at examining the factors influencing adoption of improved maize production practices by farmers in Plateau state Nigeria.

Objectives of the Study

The general objective of this study is to assess the factors influencing adoption of improved maize

production practices by farmers in Plateau State, Nigeria.

The specific objectives are to:

i. Evaluate the institutional factors that influence adoption of improved maize production practices by farmers in Plateau State.
ii. Assess the level of adoption of improved maize production practices by farmers in Plateau State.

Research Questions

i. What are the institutional factors that influence adoption of improved maize production practices by farmers in Plateau State?
ii. What is the level of adoption of improved maize production practices by farmers in Plateau State?

Hypothesis

The following null-hypotheses will be tested at 0.05 level of significance:

Ho_1: Institutional factors have no significant influence on adoption of improved maize production practices by farmers in Plateau State

Ho_2: Level of adoption has no significant influence on adoption of improved maize production practices by farmers in Plateau State

Methodology

Descriptive survey research design was used. The population of the study was 158 registered maize farmers in Mangu Local Government Area. All the registered maize farmers were used as sample. The instrument for data collection was structured questionnaire adopted from Agwu (2015) tagged Factors Affecting Adoption of New Technologies (FAANT). Interview schedule was organized for respondents who cannot read and interpret the questionnaire. The researcher and 2 research assistants interpreted the contents of the instruments. The items were divided into four sections namely section A, B, C and D. Section A elicits information on socio-economic characteristics of maize farmers. Section B seeks information on the institutional factors that affect adoption of improved maize production practices. Section C also elicits information on level of farmers' awareness on the improved maize production practices while section D seeks information on the level of adoption of improved maize production practices. All question items in sections C and D were restricted to a set of possible response which was rated using four scale system; Very High (VH), High (H), Low (L) and Very Low (VL) which was waited 4, 3, 2 and 1 respectively. Face to face method of item distribution was adopted and interview schedule was also adopted for those farmers who can't read and interpret the content of the questionnaire. The data collected was analyzed using both descriptive and inferential statistics. Descriptive statistics of frequency and percentages were used to describe the characteristics of respondents while mean and standard deviation were used to answer all research questions. Inferential statistics of multiple regressions was used to test all null hypotheses at probability level of 0.05 alpha level of significance.

Findings

Research Question I: What are the institutional factors that influence adoption of improved maize production practices by farmers in Plateau State?

Table 1: Frequency and Percentage Description of Institutional Factors of Maize Farmers

	Variable	Frequency	Percentage
Extension Contact	No Contact	12	3
	Weekly Contact	42	11
	Monthly Contact	80	21
	Bi-monthly Contact	69	16
	Quarterly Contact	106	28
	Once/twice a Year	58	16
Membership of Farmer/Cooperative Organization	None)	18	5
	1Farmer/Cooperative Organization	108	29
	2Farmer/Cooperative Organizations	116	31
	3Farmer/Cooperative Organizations	120	33
	4Farmer/Cooperative Organizations	9	2
Access to Credit/Loan	No access	69	19
	Partial Access	241	65
	Full Access	61	16
Access to Subsidized Inputs	No access	69	19
	Partial Access	241	65
	Full Access	61	16
Sources of Information	Agricultural development project	80	26
	Research Institutes	18	5
	Radio/Television station	105	28
	Field day	65	18
	Extension agent	55	15
	Relatives/friends	48	13

Source: Field work 2022

The analysis of results in Table 1: showed the institutional factors that influence adoption of improved maize production practices by farmers in Plateau State. The results revealed that 12 respondents representing 3% have no extension contact regarding improved maize production practices. Those who have weekly extension contact were 42 (11%). 80 respondents representing 21% have monthly contact. Those who enjoy bimonthly extension contact were 69 representing (16%) while 106 and 58 respondents (35% and 16%) benefit from quarterly and once/twice a year extension contacts. This implied that those who benefit quarterly extension contact were the highest respondents.

Regarding membership of farmer/cooperative organization, 18 (5%) respondents had no membership of farmer/cooperative organization. 108 respondents representing 29% were members of 1 farmer/cooperative organization. Those who were members of 2 and 3 farmer/cooperative organizations were 116 and 120 representing 31%

and 33% respectively. Only 9(2%) respondents were members of 4 farmer/cooperative organizations. This implied that those who were members of 3 farmer/cooperative organizations were the highest respondents. Regarding access to credit/loan, 69 respondents representing 19% have no access to credit/loan. 241 and 61 representing 65% and 16% have partial and full access to credit/loan. This implied that those who have partial access to credit/loan were the highest respondents. The results of sources of information revealed that 80 (21%) respondents obtain information from Agricultural Development Project. 18 and 105 respondents representing 5% and 28% obtain information from research institute and television station while 65 and 55 respondents representing 16% and 15% obtain information from filed day and extension agents. 48 respondents (13%) get information from relatives/friends. This implied that those who get information from radio/television sources were the highest respondents.

Research Question 2: What is the level of adoption of improved maize production practices by farmers in Plateau State?

Table 2: Description of Level of Farmers' Adoption of Improved Maize Production Practices

S/N	Farm Practices	X	SD	RMK
1.	**Use of Improved Seeds**			
	Early maturing variety (80-90 days)	2.76	.887	Low
	Extra-early maturing variety (70-80 days)	2.19	.844	High
	Medium maturing variety (100-110 days)	3.02	.820	High
	Drought tolerant variety	2.78	1.12	High
2.	**Land Preparation**			
	Ploughing	2.9919	.955	High
	Harrowing	2.9162	1.10	High
	Ridging	2.8108	.850	High
	Animal traction	1.96	.848	Low
	Zero tillage	2.31	1.10	Low
3.	**Planting**			
	Early planting	2.54	.939	High
	High density cropping	2.64	.989	High
	Double row cropping	2.45	1.01	Low
	Dibbling	2.22	.856	Low
	Spacing between one plant and another on ridge (20-45cm	3.24	.829	High
	Plant spacing between ridges (70-100cm)	3.03	.810	High
	Amount of seed needed per hole (2)	2.72	1.03	Low
	Sowing depth (2-5cm in moist soil and 6-8cm deep in dry condition)	2.9892	.948	High
4.	**Seed Dressing**			

	Use of Aldrex T and Fernasan D to protect seed in the soil from soil pest	2.46	.748	Low
5.	**Fertilizer application**			
	Quantity to be applied:	2.63	1.05	High
	Urea – 3 bags/ha	2.2405	.927	High
	NPK – 8 bags/ha	2.88	.781	High
	Number of application – 2 times	2.54	.885	High
6.	**Herbicides**			
	Paraquate	3.02	.827	High
	Atrazine	2.98	.931	High
	Premextra	2.80	.788	High
	Lasso	2.76	.994	High
	Gramazone	3.00	.809	High
7.	**Manual weeding**			
	Two weeding	3.02	.824	High
	One weeding	2.90	.942	High
	More than two weeding	2.79	.864	

Source: Field work 2022

The analysis of results in Table 2: showed the level of farmers' adoption on improved maize production practices in Plateau State. The results revealed that farmers' level of adoption of components of improved seeds is high except use of extra-early maturing variety (80-90 days) which is low (2.19). The farmers' level of adoption regarding ploughing, harrowing and ridging is high and their adoption on animal traction and zero tillage is low (1.96 and 2.32). The farmers' adoption of early planting, double row cropping, spacing between one plant and another on ridge (20-45cm, plant spacing between ridges (70-100cm) and amount of seed needed per hole (2) and sowing depth (2-5cm in moist soil and 6-8cm deep in dry condition) is low (1.65) is high (>2.5) and their adoption on dibbling is low (2.22). The level at which farmers adopt Aldrex T and Fernasan D to protect seed in the soil from soil pest is also high (3.22). Farmers' level of adoption regarding improved method of fertilizer application is also high (>2.5). The level at which they adopt Paraquate, Atrazine, Premextra, Lasso and Gramazone as herbicides is high. The adoption of improved manual weeding and harvesting in maize production practices is also high by the farmers. This implied that farmers highly adopted improved maize production practices in Plateau State.

Test of Null Hypothesis

HO_1: Institutional factors have no significant influence on adoption of improved maize production practices by farmers in Plateau State.

Table 3. Multiple Regressions on Institutional factors that influence adoption of improved maize production practices by farmers

Variable	T	Coefficient	Std. Err	r.cal.	Sig.
Extension Contact	341.534	19.852	.015		.000
Membership of Farmers/Cop.	258.221	29.852	.782		.000
Access to Credit/.Loan	399.499	-47.378	.770		.000
Access to Subsidized inputs	229.463	36.411	.962	.516	.000
Sources of Information	278.359	63.021	.615		.000

Source: Field work analysis 2022

The analysis of results in Table 4.6 showed the influence of institutional factors on adoption of improved maize production practices by farmers. The analysis revealed r-cal. of 0.516 at difference sig. level and coefficients. Extension contact influences adoption of improved maize production practices by 19% which is significant at .000. Membership of farmers/cooperative influences adoption of improved maize production practices by 29% which is significant at .000. Access to credit/loan influences adoption of improved maize production practices by 47% which is significant at .762. Access to subsidized inputs influences adoption of improved maize production practices by 36% which significant at .000 and sources of information influences adoption of improved maize production practices by 63% which is significant at .000. This implied that sources of information have the highest influence in adoption of improved maize production practices by farmers while age and gender do not influence.

HO_2: Level of farmers' adoption has no significant influence on adoption of improved maize production practices in Plateau State

Table 4. Linear Regression on Level of farmers' adoption has no significant influence on adoption of improved maize production practices in Plateau State

Variable	B	Std. Err.	Coef.	r-cal.	r^2	r-adj.	Sig.
Adoption level (Constant)	2.501	.157	.088	.088	.008	.005	.000
Adoption of New Practices	.092	.054					

Source: Field work analysis of Linear Regression 2022

The analysis of results in Table 4.Showed the influence of level of farmers' adoption on adoption of improved maize production practices by farmers. The analysis revealed r-cal. of .088 and coefficient of .088 at .000 significant levels. Farmers' level of adoption influences adoption of improved maize production practices of farmers by 88%. The r-adjusted of .005 indicates that every one unit increase in farmers' level of adoption will influence adoption of improved maize production practices of farmers by 5%. The null hypothesis that said level of farmers' adoption has no significant influence on adoption of improved maize production practices is therefore rejected. This implied that level of farmers' level of adoption influences adoption of improved maize production practices by farmers in Plateau state.

Discussion

Analysis of research question one revealed that quarterly extension contact (106/28%), 3 farmers' cooperative/organizations (120/33%), partial access to credit/loan (241/65%) and subsidized inputs (241/65) and radio/television station (105/28%) as source of information were the main institutional factors that influence adoption of improved maize production practices by farmers in Plateau State.

The analysis of null hypothesis one revealed that the influence these factors have are statistical significant (Sig. =.000). This is in line with the report of Mignouna et al (2020) who suggested that farmers within a social group learn from each other the benefits and usage of a new technology. Usman (2019) suggests that social network effects are important for individual decisions, and that, in the particular context of agricultural innovations, farmers share information and learn from each other. Studying the effect of community based organization in adoption of corm-paired banana technology in Uganda, Katungi and Akankwasa (2016) found that farmers who participated more in community-based organizations were likely to engage in social learning about the technology hence raising their likelihood to adopt the technologies. Although many researchers have reported a positive influence of social group on technology adoption, social groups may also have a negative impact on technology adoption especially where free-riding behavior exists.

Bandiera and Rasul (2019) as cited by Hogset (2015) suggests that, learning externalities generate opposite effects, such that the more other people engage in experimentation with a new technology, the more beneficial it is to join in, but also the more beneficial it is to free-ride on the experimentation of others. As a result of these contradictory effects, Bandiera and Rasul (2019) propose an inverted U-shaped individual adoption curve, implying that network effects are positive at low rates of adoption, but negative at high rates of adoption. Acquisition of information about a new technology is another factor that determines adoption of technology. It enables farmers to learn the existence as well as the effective use of technology and this facilitates its adoption. Farmers will only adopt the technology they are aware of or have heard about it.

The analysis of null hypothesis two revealed that the level of farmers' adoption significantly influence adoption of improved maize production practices by farmers in Plateau State. (r = .088, Sig. =.000). This finding concurs with what Komolafe (2014) said regarding adoption of improved production practices who revealed that level of education, household size, farming experiences, access to credit and yield of improved maize varieties were found to be significantly related to the adoption of improved maize varieties (Kudi, 2020). According to age, marital status, level of education and farming experiences were found to be significantly related to the adoption of improved crop practices. Marital status, educational level and household size of the maize farmers were found to be significant to the adoption of improved maize varieties (Umar etal, 2016). Idrisa (2020) reported that education, yield, access to credit and extension contact were found to be significantly related to the adoption of improved maize seeds among farmers. Age, sex, level of education, farm size and extension contact were found to be significantly related to the adoption of improve maize production technology among farmers (Bawa & Ani, 2014). Jamilu (2018) explained that age, educational level, extension contact and access to credit were found to be

significantly related to the adoption of Sasakawa Global Maize Production Technologies among farmers. Olusegun (2020) reported that higher education level, farm size, as well as access to fertilizer and extension services were socio-economic and intuitional factors that would increase the probability of adopting improved maize varieties among maize farmers. Cotonou (2017) found that farmers adopted fertilizer application in maize production while close spacing, weeding frequency and dig and cover method of fertilizer placement were rarely adopted. According to Lavison, (2017), farmers' decisions about whether and how to adopt new technology are conditioned by the dynamic interaction between characteristics of the technology itself and the array of conditions and circumstances. Diffusion itself results from a series of individual decisions to begin using the new technology, decisions which are often the result of a comparison of the uncertain benefits of the new invention with the uncertain costs of adopting it (Hall & Khan, 2002). An understanding of the factors influencing this choice is essential both for economists studying the determinants of growth and for the generators and disseminators of such technologies (Hall & Khan, 2002). Traditionally, economic analysis of technology adoption has sought to explain adoption behavior in relation to personal characteristics and endowments, imperfect information, risk, uncertainty, institutional constraints, input availability, and infrastructure (Uzosike, 2018)). A more recent strand of literature has included social networks and learning in the categories of factors determining adoption of technology (Usman, 2019). Some studies classify these factors into different categories. For example, Akudugu etal (2017) grouped the determinant of agricultural technology adoption into three categories namely; economic, social and institutional factors.

Conclusion/Recommendation

Based on the findings of the study, the following recommendations were made.

Federal government as well as NGOs should intensify institutional factors such as extension contact, credit/loan, farm input, radio/television to influence adoption of improved maize production practices by farmers. There should be awareness campaign by the government on the new farming practices and their benefits in order to increase farmers' level of awareness regarding adoption of improved maize production practices by farmers.

Based on the findings of this study, it was concluded that increase in socio-economic status of farmers, farmers/extension agents contact physically and via radio/television and awareness of improved farming practices enhanced adoption of improve maize production practices which will in turn increase farmers' yield. This also implied that low level of awareness from the side of the farmers regarding the use of improved farming practices will affect the adoption of new maize production practices among farmers in Plateau State as supported by Yusuf (2018) agreed that farmers adoption of improved farming practices is greatly been affected by their level of awareness.

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