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FACTORS ASSOCIATED WITH DISCONTINUANCE OF ADOPTION OF IMPROVED RICE PRODUCTION TECHNOLOGIES IN NASARAWA AND PLATEAU STATES, NIGERIA

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Abstract

The study analyzed factors associated with discontinuance of improved rice production technologies in Nasarawa and Plateau States, Nigeria. A multistage sampling technique was employed to select 310. Data were collected from primary source, using a structured questionnaire. Data collected were analyzed using descriptive statistics such as frequencies, percentages, and factor analysis. The result shows that use of tractor (97.22%) and NPK fertilizer (96.67%) recorded the highest awareness in Nasarawa State, herbicide (98.46%) and NPK fertilizer (98.46%) had the highest in Plateau State. Nerica seed variety (86.11%) and NPK fertilizer (83.33%) had the highest discontinuance in Nasarawa State while Faro seed variety (96.92%) and use of tractor (96.15%) had the highest discontinuance in Plateau State. Most respondents in the two states complained of lack of funds and inputs as well as high cost of inputs. The factor analysis result produced three broad categories of factors: socioeconomic factors that loaded high were farming experience, household size, membership of association and lack of extension contact. Technological factors that loaded high were availability of input, cost of inputs, relative advantage, complexity and farmers income. Politico-cultural factors thatloaded high were political and religious crisis, frequent changes of Government policies and lack of incentives significantly affected discontinuance of improved rice production technologies. It was recommended that government at all levels and non-governmental extension service providers should deliberately step up efforts at ensuring that farm input such as improved seed, herbicides, fertilizer and tractors are made available to the farmers on time and at reasonable cost.

Keywords: Factors, associated, discontinuance, rice, production, technologies

Introduction

After attainment of independence, several projects and programmes were tried by successive Nigerian Governments to increase productivity of the agricultural sector of the nation's economy. Among these, were the National Accelerated Food Production Project

(NAFPP) in 1974, the Agricultural Development Programs (ADPs) in 1975, Operational Feed the Nation (OFN) in 1976, the River Basin Development Authority (RBDAs) in 1977, the Directorate of Food, Roads and Rural Infrastructure (DFFRI) in 1988, and the National Agricultural Land Development Authority (NALDA) in 1991, etc (Tijjani, Bakare, & Adebayo, 2016; Bello *et al.,* 2012). Rice (*Oryza sativa*) is the most important staple food for about half of the world human race (Oyinbo, Damis & Rekwot, 2013; National Cereals Research Institute, NCRI, 2004). The demand for rice in sub-Saharan Africa is growing much faster than for any other grain, with both the rich and the poor relying on it as a major source of calories (Longtau, 2003). Nigeria has a potential land area of about 6.8 hectares and only 35% of it is under cultivation with rice (Oyinbo *et al.,* 2013). The small numbers of hectares under rice cultivation is an indication that food sufficiency through rice production has not yet been realized as rice production is left in the hands of smallholders whose output is inadequate and paddy processing is substandard (Daramola, 2015).

Adoption of an innovation is the decision of an individual or group to accept and use an innovation (Adekoya & Tologbonse, 2011). The adoption process occurs over a period of time and comprises a series of actions and functions such as awareness, interest, evaluation, trial and adoption stages. Discontinuance is a decision to reject an innovation after having previously adopted it. According to Rogers (2003), there are two main types of discontinuances namely, replacement and disenchantment. Replacement discontinuance is a decision to reject an idea in order to adopt a better idea that supersedes it. Disenchantment discontinuance on the other hand is a decision to reject an idea as a result of dissatisfaction with its performance. The constraints for poor outputs include inadequate use of improved varieties, correct spacing method, and poor weed control, lack of inorganic fertilizer application, poor tillage operations and processing. (Plateau State Agricultural Development Project, PADP, 2014).

Methodology

The Study Area

The study was carried out in Nasarawa and Plateau States. Nasarawa State was created out of former Plateau State on 1st October 1996. The state lies between latitudes 7° and 9°N and longitude7° and 10° E. It has a mean temperature of 60°F and 80°F with an annual rainfall ranging between 131.73cm and 145cm. The months of December to February experience the North East trades winds (harmattan). Rainy season is from April to October, it has a projected population of 2.9 million people (National Population

Commission (NPC), 2018). Plateau State is located in the North Central of Nigeria. The State has projected human population of 4.1 million people (2018 projected figure at 3% exponential growth rate) (NPC, 2018), with land area of about 26,899 km^2. It is located between latitude 9°10'N and longitude 9°45'E. It has a temperate climate type with an average temperature of between 18°C and 22°C. Harmattan winds caused the coldest weather between December and February with temperature range of 15°C and 18°C.. The annual rainfall varies from 1317.50 mm to 1460 mm. Agriculture is the major economic activity in Plateau State. (Plateau State Government, 2017)

Population and Sample Size Selection

Population of this study consisted of all rice farmers in Nasarawa and Plateau States. A total of three hundred and ten respondents were selected using a multistage sampling technique. Firstly, two States were purposively selected because of their contiguous nature. Secondly, each of these two States were stratified into southern, central and western for Nasarawa State (NADP, 2012) and northern, central and southern for Plateau State, (PADP, 2014) but only the southern zones were considered for this study because of their level of rice production. Thirdly, two blocks each were purposively selected based on their comparative advantage in rice production (NADP, 2012; PADP, 2014). Fourthly, three cells each were purposively selected. Using a proportional allocation of 10%, a total sample size of three hundred and twenty five respondents selected.

The data were collected from primary sources with the use of a structured questionnaire. Data for this study were analyzed using descriptive statistics such as percentage, frequency and factor analysis.

Results and Discussion

Level of Awareness and of Rice Improved Production Technologies by Rice Farmers in Nasarawa and Plateau States

The result (Table 1) shows that the use of NPK fertilizer had the highest (99.35%) awareness level followed by use of tractor and herbicide each recorded 96.77 percent awareness level, Nerica and ITA varieties had 95.81 percent and 94.52 percent awareness levels respectively. The breakdown of respondents' level of awareness of improved rice production technologies in Nasarawa (N) and Plateau (P) States shows that majority (N=97.22%; P=98.46%) of the respondents were aware of use of tractor technology, use of fertilizer (N=96.67%; P=97.69%), Nerica seed (N=94.44%; P=97.69%), Faro seed (N=83.33%; P=96.92%), Herbicide (N=94.44%; P=98.46%). Faro seed variety and correct

spacing were reported by respondents to record the least (89.03%) and (84.84%) awareness levels respectively. The result shows that, there was high level of awareness of improved rice production technologies in the study area, thus high rate of adoption was expected because adoption starts with awareness and farmer can only adopt what he knows. Awareness promotes demand and demand is a force for rapid adoption and spread of improved technologies. This confirms Nwalieji, Madukwe, Agwe and Umerah (2014) who reported high awareness among rice farmers and processors in Anambra and Ebonyi States.

Table 1: Distribution of Respondents on the Basis of Awareness of Improved Rice Production Technologies Promoted in Nasarawa and Plateau States.

	Nasarawa State (N=180)		Plateau State (n=130)		Pooled (n=310)	
Technologies	**freq.**	**%**	**freq.**	**%**	**freq.**	**%**
Nerica variety	170	94.44	127	97.69	297	95.81
Faro variety	150	83.33	126	96.92	276	89.03
ITA variety	169	93.89	124	95.38	293	94.52
Herbicide	170	94.44	128	98.46	298	96.13
NPK	174	96.67	128	98.46	308	99.35
Correct sp.	149	82.78	114	87.69	263	84.84
Tractor	175	97.22	125	96.15	300	96.77

Level of Adoption of Rice Improved Production Technologies by Rice Farmers in Nasarawa and Plateau States

On the adoption of improved rice production technology, the overall results (Table 2) indicated that respondents adopted mostly (97.42%) use of NPK fertilizer followed by use of tractor (96.77%) and ITA seed variety (93.87%) compared to herbicide technologies that was adopted by 84.19 percent of the respondents. Faro and Nerica seed varieties had the least adoption level with 52.26 percent and 17.74 percent respectively. Correct spacing technology was not adopted by a single rice farmer in the area as they complained of the tediousness in application of the technology. Out of the seven improved rice technologies promoted in the area, respondents in Nasarawa State indicated that five technologies were mostly adopted. The five technologies were use of tractor (97.22%), use of NPK fertilizer (96.67%), ITA seed variety (92.78%), and herbicide technology (82.78%). Respondents indicated that Faro seed variety (20%) and Nerica seed variety (13.89%) recorded the least adoption. Similarly, five improved rice production technologies were also adopted by most respondents from Plateau State, these were; use of NPK fertilizer and herbicide application which recorded 98.46 percent each, Faro seed variety (96.92%), ITA seed variety (95.38%) and use of tractor (89.23%). Nerica seed variety (23.08%) recorded the least adoption. The result indicates high rate of adoptions of virtually all technologies, this was expected considering the high awareness level of these technologies among the farmers in the study area. The result is similar to Ornan *et al.* (2010) who reported high rate of adoption among respondents. The findings contrast that of Daudu *et al.* (2010) who reported low adoption of rice production technologies by respondents.

Table 2: Distribution of Respondents on the Basis of Adoption of Improved Rice Production Technologies Promoted in Nasarawa and Plateau States.

	Nasarawa State (N=180)		Plateau State (n=130)		Pooled (n=310)	
Technologies	**freq.**	**%**	**freq.**	**%**	**freq.**	**%**
Nerica variety	170	94.44	127	97.69	297	95.81
Faro variety	150	83.33	126	96.92	276	89.03
ITA variety	169	93.89	124	95.38	293	94.52
Herbicide	170	94.44	128	98.46	298	96.13
NPK	174	96.67	128	98.46	308	99.35
Correct sp.	149	82.78	114	87.69	263	84.84
Tractor	175	97.22	125	96.15	300	96.77

Level of Discontinuance of Rice Improved Production Technologies by Rice Farmers in Nasarawa and Plateau States

The pooled results (Table 3) of discontinuance of improved rice production technologies revealed that majority of respondents discontinued use of tractor (85.81%), NPK fertilizer (83.23%), Nerica seed variety (82.26%), compared to only 24.19 percent of the farmers that discontinued herbicide application. The breakdown showed that for Nasarawa State farmers discontinued Nerica seed variety (86.11%), use of tractor and NPK fertilizer (83.33%) compared to respondents'(26.11%) that discontinued herbicide application. On the other hand majority (96.92%) of respondents in Plateau State discontinued Faro seed variety use of tractor (89.23%), use of NPK fertilizer (83.08%), Nerica seed varieties (76.92%) and ITA seed variety (61.54%) as against use of herbicide 21.54 percent that recorded the least discontinuance among the respondents. The result indicates high rate of discontinuance which portends a dangerous trend to food security. Empirical studies suggest that rice yield increased tremendously with the adoption and continued use of rice improved technologies. The result is in consonance with that of Imarhiagbe *et al.,* (2015) who discovered high level of discontinuance among respondents in Edo State. Similarly, Bello (2012) reported high level of discontinuance of use of tractor and NPK fertilizer among rice farmers in Nasarawa State.

Table 3: Distribution of Respondents on the Basis of Discontinuance of Improved Rice Production Technologies Promoted in Nasarawa and Plateau States.

	Nasarawa State (N=180)		Plateau State (n=130)		Pooled (n=310)	
Technologies	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Nerica variety	155	86.11	100	76.92	255	82.26
Faro variety	36	20.00	126	96.92	162	52.26
ITA variety	100	55.56	80	61.54	180	58.06
Herbicide	47	26.11	28	21.54	75	24.19
NPK	150	83.33	108	83.08	258	83.23
Tractor	150	83.33	116	89.23	266	85.81

Reasons for Discontinuances of Improved Rice Production Technologies in Nasarawa and Plateau States.

The result in Table 4 shows that a total of 307 respondents in Nasarawa and Plateau States discontinued the use Nerica seed technology because of high cost of technology (50.56%), lack of funds (42.26%) and lack of inputs (42.26%). In Nasarawa State respondents that discontinued the use of the technology complained of high cost of the input (56.05%), lack of funds (42.78%) and scarcity of inputs (36.67%). Whereas in Plateau State, 127 respondents discontinued the use of the technology due to high cost of technology (53.08%), lack of input (50.00%), and scarcity of input (41.54%).

The pooled result shows that a total of 162 respondents in the study area discontinued use of Faro seed variety and they gave the following reasons; scarcity of technology (49.40%), cost of technology (35.80%), unsatisfactory result from technology (32.72%) and lack of funds (24.69%). The respondents that discontinued the adoption of the technology in Nasarawa State did so because of scarcity of input (55.56%), lack of technology (52.78%), unsatisfactory result from input (33.33%) and lack of funds (27.22%). On the other hand respondents that discontinued in Plateau State complained of lack of input (47.62%), unsatisfactory result from the input (32.54%), high cost of technology (30.95%) and lack of input (24.40%).

Overall a total of 291 respondents discontinued the use ITA seed variety because of high cost of the technology (45.02%), scarcity of input (42.61%), unsatisfactory result from the input (41.24%) and lack of funds (30.58%). In Nasarawa State the respondents that discontinued the use of the technology did so because of the cost of technology (48.50%), lack of input (44.91%), unsatisfactory result of the technology (37.72%) and lack funds to purchase the input (35.93%). Whereas out of the 124 respondents that discontinued the technology in Plateau State complained of unsatisfactory result of the input (45.97%), high cost of the input (40.32), shortage of input (39.52%) and lack funds (23.39%).

The pooled results (Table 4) indicated that respondents discontinued the use of NPK fertilizer because of high cost (84.44%), scarcity of input (81.13%), unsatisfactory result (43.38%) and lack of funds (32.90%). The breakdown of the results revealed that respondents discontinued the use of the technology in Nasarawa State because of high cost (74.71%), scarcity of the input (71.84%), unsatisfactory result (44.83%) and lack of funds (34.48%). Similarly, respondents that discontinued the use of the technology in Plateau

State did so because of high cost of input (93.66%), scarcity of input (93.75%), unsatisfactory result (41.41%) and lack of funds (32.31%).

The overall result revealed that respondents that discontinued the use of herbicide did so because of tediousness in application of the technology (61.33%), high cost of input (53.33%), scarcity of input (45.33%), unsatisfactory result (42.60%) and lack of funds (36.00%). Out of the respondents that discontinued herbicide application in Nasarawa State did so because the technology was tedious to apply (44.68%), high cost of technology (42.55%) scarcity of input (40.43%), unsatisfactory result (36.17%) and lack of funds (21.28%). Similarly, respondents in Plateau State complained of tediousness in application of technology (89.29%), high cost of technology (71.43%), lack of funds (60.17%), lack of input (53.57%) and unsatisfactory result (53.57%) as reasons for discontinuance of adoption od the technology.

A total of 266 respondents discontinued the use of tractor technology in the study area because of unavailability of input (90.21%), high cost input (86.47%) and lack funds to (34.21%). The adoption of the technology was discontinued by respondents in Nasarawa State because of unavailability of input (90.00%), high cost of input (86.67%) and lack of funds (34.67%). Whereas in Plateau State respondents indicated unavailability of the input (90.52%), high cost of input (86.21%) and lack of funds (25.86%) were reasons for discontinuance.

The results revealed that the problems relating to farmers discontinuance of improved rice production technologies in the study area were those inherent in the nature of the technologies and the method of diffusion of the technologies. The implication is that these farmers will like to continue the use of these technologies if the inputs were available and at a reasonable cost. This is because none of the farmers have abandoned any of the technologies for a better one, which means these technologies were good. The result is similar to Bello *et al.,* (2012) ; Imarhiagbe *et al*., (2015) who attributed farmer's decisions for discontinuance of improved rice production technologies to unavailability of improved seed varieties, inability to secure the use of tractor, inability to purchase fertilizers and herbicides as well as cumbersome nature of manual operation of recommended spacing technology.

Table 4: Distribution of Respondents by Reasons for Discontinuance of Adoption of Improved Rice Production Technologies

	Nasarawa State		Plateau State		Pooled	
Technology/ Reasons	**F**	**%**	**F**	**%**	**F**	**%**
Nerica Variety	**(n = 180)**		**(n=127)**		**(n=301)**	
Lack of funds	77	42.78	54	41.54%	131	42.26
Lack of inputs	66	36.67	65	50.00	131	42.26
Expensive	88	56.05	69	53.08	157	50.65
Faro variety	**(n = 36)**		**(n = 126)**		**(n = 162)**	
Lack of funds	8	22.22	32	25.40	40	24.69
Lack of inputs	20	55.56	60	47.62	80	49.40
Expensive	19	52.78	39	30.95	58	35.80
Unsatisfactory Result	12	33.33	41	32.54	53	32.72
ITA Variety	**(n = 167)**		**(n = 124)**		**(n = 291)**	
Lack of funds	60	35.93	29	23.39	89	30.58
Expensive	75	44.91	49	39.52	124	42.61
Expensive	81	48.50	50	40.32	131	45.02
Unsatisfactory Result	63	37.72	57	45.97	120	41.24

Correct spacing		**(n = 180)**		**(n = 130)**		**(n = 310)**
Tedious	135	90.60	110	96.49	245	93.16
Difficult to understand	65	43.62	58	50.88	123	46.77
Unsatisfactory result	51	34.23	38	33.33	89	33.84
Herbicide	**(n = 47)**		**(n = 28)**		**(n = 75)**	
Lack of funds	10	21.28	17	60.71	27	36.00
Lack of inputs	19	40.43	15	53.57	34	45.33
Expensive	20	42.55	20	71.43	40	53.33
Tedious	21	44.68	25	89.29	46	61.33
Unsatisfactory result	17	36.17	15	53.57	32	42.67
Tractor	**(n = 150)**		**(n = 116)**		**(n = 266)**	
Lack of funds	52	34.67	39	25.86	91	34.21
Lack of inputs	135	90.00	105	90.52	240	90.21
Expensive	130	86.67	100	86.21	230	86.47

Nn

*Multiple Responses Recorded

Factors Affecting Discontinuance of Adoption of Improved Rice Production Technologies

Table 5 shows that there were three major categories of factors affecting discontinuance of adoption of improved rice production technologies in Nasarawa and Plateau States, namely: socioeconomic factors (Factor 1) technology related factors (Factor 2) and politico-cultural factors (Factors 3).

Factor 1, is described as socioeconomic factors and those that had significant effect on discontinuance of adoption of improved rice production technologies in Nasarawa and Plateau States were farming experience (0.5582), household size (0.6009), literacy (0.469), membership of association (0.3322) and lack of extension contact (0.4762), Factor 2 is described as technology related factors and those that had significant effect on discontinuance of adoption of improved rice production technologies in the study area were availability of inputs (0.3293), cost of inputs (0.4798), relative advantage (0.4816) complexity of technologies (-0.4255), farmers' income (-0.3906), poverty barriers (-0.3778) and lack of awareness (-0.4151). Factor 3, is described as the politico-cultural factors and those that significantly affected discontinuance of adoption of improved rice production technologies in Nasarawa and Plateau States were withdrawal of subsidy (0.3030), frequent changes of government policies (0.3346) and lack of incentives to rice farmers (0.3957).

These findings have several implications on rice production generally in the study area. Firstly, the variables of socioeconomic factors such as farmer's income may hinder farmers from acquiring improved technology which will lead to discontinuance of adoption of such improved rice technologies. As a result, rice production will decrease thus causing food insecurity in Nigeria in general and the study area in particular. Similarly, lack of extension contact with rice farmers may adversely affect their level of knowledge and skills needed for sustainable adoption of improved rice production technologies.

Besides, technology related traits such as high cost of inputs, relative advantage and complexity of innovations may either sustain farmers' adoption or cause discontinuance of adoption of improved rice technologies, hence discontinuance of adoption of earlier adopted rice production technologies. Furthermore, variables of politico-cultural factors such as withdrawal of subsidies, frequent changes in government policies and lack of incentives to rice farmers may lead to discontinuance adoption of improved rice production

technologies. The findings confirms that of VanTongeren, (2003) who submitted that the end of subsidies, social and economic factors such as income and credit availability were major factors in the discontinuance process among rice farmers. In the same vain Gyata (2018) found two broad categories of factors namely politico-administrative and socioeconomic cum-infrastructural that are associated with adoption of electronic wallet by rice farmers in Benue and Taraba States.

Table 5: Factor Analysis Showing Factors Affecting Discontinuance of Adoption of Improved Rice Technologies in Nasarawa and Plateau States

Variable	Factor 1	Factor2	Factor 3
• Farming experience	0.5582*	-0.0696	-0.0784
• Household size	0.6009*	0.0700	-0.1293
• Literacy	0.4659*	-0.0120	-0.1585
• Membership of Association	0.3322*	0.1696	0.0084
• Lack of extension contact	0.4762*	0.0602	0.0156
• Availability of inputs	-0.1263	0.3293**	0.2708
• Cost of inputs	0.4798	-0.2024 **	-0.0503
• Relative advantage	-0.0482	0.4816**	-0.315E-02
• Complexity	0.1886	-0.4255**	0.376E-02
• Farmers' income	0.0626	-0.3906**	0.0281
• Poverty barriers	-0.1101	-0.3778**	-0.1055
• Lack of awareness	-0.0912	-0.4151**	-0.0834
• Cultural barriers	-0.0743	0.0549	-0.0273***
• Political and religious crises	0.0498	0.1395	0.0786***
• Withdrawal of subsidy	0.265-	0.1064	0.3030***
• Frequent changes of Govt, policies	0.2989	0.1874	0.3346***
• Lack of incentives	0.0775	0.1064	0.3957

Method: varimax with Kaisers' Normalization

*- Factor 1: Socioeconomic factors

*- Factor 2: Innovation cum farmers' related factors

***- Factor 3: Politico -cultural factors

Conclusion and Recommendations

Based on the findings of this study, it was concluded that, majority of the rice farmers in the area were aware of almost all the technologies promoted, majority of them adopted most of the technologies but along the line majority discontinued many of the technologies earlier adopted. Majority of the rice farmers observed that scarcity of the input, lack of funds to purchase the inputs, high cost of inputs were reasons for discontinuance of the improved technologies.

Rice farmers in the area generally agreed that the improved technologies were better than their old practices; this suggests that farmers were ready to sustain the adoption of these technologies if those problems they encountered were solved. Three broad factors namely socioeconomic, technological and politico-cultural were found to affect discontinuance of adoption of improved rice production technologies in the study area.

The following were recommended:

Government at all levels and Non-governmental extension service providers should deliberately step up efforts at ensuring that farm input such as improved seed, herbicides, fertilizer and tractors are distributed and made available on time and at reasonable cost.

Financial institutions and cooperatives should provide more credit facilities to rice farmers so as to enable them purchase rice improved technologies.

More funding of research on rice improved technologies is required by Government and other voluntary organizations in order to make the inputs more accessible and at reasonable cost.

References

Adekoya, A. E., & Tologbonse, E. B. (2011). Adoption and diffusion of innovation. *Agricultural Extension in Nigeria*, Ilorin. AESON, 2(1), pp.36-48.

Bello, M., Salau, E. S., & Ezra, L. (2012). Analysis of Factors Influencing Discontinuance of Technology Adoption: The situation with some Nigerian farmers. *Sustainable Agricultural Research,* 1(2), 43.

Central Bank of Nigeria (2014). Annual Report and Statement for the year ended 31 December, 2014. Cross Rivers State Nigeria. 56

Daramola, B. (2015). Government Policy and Competitiveness of Nigerian Rice. Economic paper presented at the workshop on rice policy and food security in sub Saharan Africa, organized by WARDA Cotono republic of Benin 7th – 9th November

Daudu, S., Igbashal, A. A., & Ucherwuhe, 1. (2010). Adoption of improved Rice production Technologies by small – scale farmers in Makurdi Local Government Area of Benue

State, Nigeria. *Journal of Rural Development Agriculture and Science.* 1 (1), 41.

Imarhiagbe, P., Umar, H. Y., & Agbonkolor B. N. (2015) factors associated with discontinuance of rubber production technologies among small scale farmers in Edo state Nigeria. *Sky journal of Agriculture Research,* 4(8), pp.156-160.

Longtau, S. R. (2003a). Multi- agency partnership for technical change in West African agriculture: Nigeria case study report on rice production. Eco systems development organization (edo) Jos, Nigeria. Retrieved on September 1, 2011 from www.odi.org.uk/rpeg/maps/nigeria.pdf.

Nasarawa Agricultural Development Programme (NADP) (2012). Annual situation report, lafia, Nigeria, pp.18- 24.

National Cereal Research Institute (2004). Training Manual on Rice production and Processing produced for the Presidential Initiative on Paddy Rice Production for rice mills in the North Central Zone of Nigeria held at Baddegi, pp.1- 80.

National Population Commission (NPC) (2018). National Population Census, reprint, Abuja, Nigeria, pp.7-10.

Nwalieji, H. U., Madukwe, M. C., Agwu, A. E., & Umerah, M. I. (2014). Adoption of Rice Technologies introduced by the United States Agency for international Development in Anambra and Ebonyi states, Nigeria. *Journal of Agriculture Extension,* 18(1), pp.12-16.

Ornan, H., Khobe, D., & Ornan, B. (2010). Adoption of agricultural innovations by rice farmers in Yola- South Local Government, Adamawa State, Nigeria. *Global Journal of science Frontier Research.* 10(4), pp.78- 81.

Oyinbo, O. Damis, M.A., & Rekwot, U.Z. (2013). Growth Trend of Rice Demand and supply in Nigeria: An investment Opportunity for youth and women Empowerment. Russian Journal of Agriculture and Social Sciences, 4(16), pp.31-34

Plateau State Government (20017) http//:plateaustate.govw.ng. Retrieved 21st October.

Plateau Agricultural Development Project (PADP) (2014). Annual Evaluation Report, published by Monitoring and Evaluation Unit, Dogon Dutse, Jos, pp. 43-45.

Rogers, E. M. (2003). *Diffusion of Innovations.* New York: 5th Edition; the Free Press, New York, pp. 78-124.

Tijjani, A., Bakari, U. M., Usman S., & Adebayo, E.F. (2016). Determinants of Adoption of Agricultural Technologies among Rice Farmers in Taraba State, Nigeria. International journal of Innovative Research in Social Sciences & Strategic Management Techniques, 3(2) 15.

Van Tongeren, P. (2003). Assessing Agricultural Development Interventions in the Western Highlands of Guatemala: A farmer centered Approach. Unpublished Master's thesis, Michigan State University, East Landing, pp. 95-100.

West African Rice Development Association (WARDA) (2003). Rice Trends in Sub-Saharan African: A Synthesis of Statistics on Rice Production, Trade and Consumption, UK, Sayce Publishing, pp.1-22.