Determinants of Agricultural Innovations Adoption among Cooperative and Non-Cooperative Farmers in Imo State, Nigeria

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ABSTRACT

This study examined the determinants of agricultural innovations adoption among cooperative and non-cooperative farmers in Imo State, Nigeria. The research design used in this study is descriptive survey research design. The area of study was Imo State, and data were gotten from the three zones, namely, Orlu, Owerri and Okigwe. Data were generated from a total population of 1184 registered cooperatives and non cooperative farmers. Using Taro Yamane formula, a total of 464 respondents were selected from both cooperative and non-cooperative farmers. Questionnaire was the instrument of data collection. Descriptive statistics and one-way Analysis of Variance (ANOVA) were employed to address the research questions and to test the promulgated hypothesis. The findings revealed that important determinant of adoption include educational level, annual income, farm experience, frequency of contact, cooperative membership, price of the produce, type of media used, government policy, availability of success stories, frequency of training, attitude to novel ideas, household size, extent of livelihood diversification, availability of markets and parents occupation. Determinants of agricultural innovation adoption were also the same for cooperative and non-cooperative farmers. Based on the findings made in the study, the study recommends that cooperative extension services need to be revolutionalized and given adequate attention. This can be achieved by developing new framework for cooperative extension and forging a common ground for both cooperative and agricultural extension work. Apart from recruitment and deployment of competent and well motivated staff, there is the need for provision of work gadget and work tools that are in tune with technological changes. Supervision and retraining of extension staff should also become a priority.

KEYWORDS: *Agricultural Innovations, Cooperative, Farmers*

INTRODUCTION

The agricultural sector is an important component of Nigerian economy with over 70% of the population engaged in agriculture and agricultural related activities (Obasoro, 2015). The sector is almost entirely dominated by small-scale resource, poor farmers living in rural areas. Agriculture is the main pillar of any economy because of the many significant roles it plays. It is a major source of food for the population, provides employment opportunities, earns foreign exchange as well as serves as sources of raw materials for the nation's industries. Increasing agricultural production can increase food availability and enhance access to rural incomes and rural welfare. Rural areas are home to 75 percent of Africa's population, most of who count agriculture as their major source of income. Fortunately, Africa has experienced continuous agricultural growth during the last few years. Rahman and Rahman (2008) noted that the principal solution to increased food production lies in raising the productivity of land given the existing varietal mix. In most countries, future sustainable agricultural growth will require a greater emphasis on productivity growth, as suitable area for new cultivation declines, particularly given growing concerns about deforestation and climate change. Egwu,(2014) noted that agriculture still retains its position as the bulk walk upon whose solid foundation the economy of Nigeria is based (Adebo & Ewuola, 2006). Growth in agriculture has been linked to development in other sectors which invariably contributes to poverty alleviation (Khan, 1999). Thirtle, Lin and Piesse (2003) observed that development in agricultural sector has a powerful impact on poverty because it helps majority of poor people, compared with other development sectors of the economy. It is paramount, therefore, that the enterprises in the agricultural sector in Nigeria keep up with the current developments in the world.

Sustainable agricultural technology for Nigeria is important for the country's effort at achieving food security and increasing food production. (Ladebo, 2004). Generations of agricultural research technologies are meaningful only when they are adopted at the farm level (Oyolu, 1983). According to Robert, Arnold and Lori (1999), it is partly justified to say that farmers are sometimes poor because they have not been able to adopt agricultural technologies fast enough to keep pace with change in the new knowledge of agricultural

development. The farmers should be adequately informed in this connection, trained in new innovation and be provided with the modern equipments and tools to enhance adoption and as a result, increase production. Adoption of new technologies was found to be dependent on the interaction of a number of factors and organized delivery of inputs and outputs, provision of technical advices, stable price and credit for participating farmers are all important determinants of farmers' adoption of innovation. (Ladebo, 2004). In the viewpoint of Onyenweaku (1991), profitability and advice from change agents were the major reasons for adoption, while the characteristics of the innovation itself "relative advantage, costs, complexity, visibility, divisibility and compatibility" are the major factors that affect the adoption of any innovation. Justina (2010), Rogers (1962) and Van Den Ban and Hawkins (1991) further observed that an innovation or technology to be adopted must pass through process of adoption which involves awareness, interest, evaluation, trial and adoption.

Agricultural technology is changing fast from conventional methods and techniques to modern scientific methods and techniques. Farid et al., (2014) noted that several factors may have influence on the extent of adoption of farm practices such as characteristics of farm practice; the adopters; the change agent; 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 literature it is evident that adoption of technologies in farming practices is affected by certain factors (Ziervogel et al., 2005; Hansen et al., 2007; Salehin et al., 2009). The farmer's attitude towards change, land, sources of information, membership of farmer's organizations, educational level, farm income, farmer's exposure, are the important socio-economic factors influencing adoption of farm innovations (Rousan, 2007). Factors that trigger adoption of new technologies comprise of age, education, sex, higher income level, risk orientation and decision making ability of farmers (Feder & Slade, 1984). Factors limiting adoption of new farm technology includes conservative lifestyle, illiteracy, and belief system.

Agricultural cooperatives encourage members to engage in joint cultivation of food and cash crops, among others. In view of the low financial capacity and high level of underdevelopment, an individual farmer cannot achieve the desires for large-scale production. It is, therefore, in the farmers' interest that resources are pulled together so as to gain a tremendous collective advantage and thus widen the industrial base of the economy and the management techniques of the farmers (Enikaselu *et al*, 2005). Successive governments in Nigeria recognize that cooperative societies are essential for the development of the agricultural sector. This laudable goal was supported by the establishment of the Agricultural Development Programmes (ADPs) and the River Basin and Rural Development Authorities (RBRDAs). Both ADPs and RBRDAs always organize farmers under their programmes into cooperative groups for better co-ordination of the farmer's activities. The cooperatives approach to group action has been effectively utilized by these two programmes. Although, the primary objective of forming group farming cooperatives in ADPs and RBRDAs is

to increase agricultural production, it has been possible to get them involved in marketing of their produce as well.

Statement of the Problem

Agricultural sector employs about 60% of Africa's workforce, yet 1/4 of the world's undernourished and hungry people live in Africa. Despite impressive economic growth rates across Africa, many of the continent's people remain food insecure. Africa's food insecurity is growing worse with population estimations at 2.4 billion in 2050. With vast land on the continent, famine and starvation should be a thing of the past. Major reason adduced for this situation is the use of outdated and ineffective farming methods. All over the globe, both for agricultural cooperative farmers and non-agricultural cooperative farmers, the methods of agriculture have changed considerably, with problems of diseases, unreliable rainfall and climate resulting in floods and drought. There is an urgent need to employ modern innovative technologies to help optimize yields and increase production. Unlike in other regions of the world, productivity of agriculture in Nigeria is poor (Obasoro, 2015). This has resulted to increase emphasis on agricultural transformation using agricultural innovation. This shift towards an innovation systems orientation was precipitated by the realization that despite stronger national research systems, agricultural productivity remained low as a result not only of the lack of appropriate technologies and the lack of access to those technologies, inputs, credit and access to markets and rural infrastructure, but also because of gaps in information and skills that prevented rural producers from effectively utilizing and adopting technologies (Sanginga et al., 2009).

Research has shown that the extent to which these farmers adopt new innovation in the study area is low. There is therefore, the need to evaluate the extent to which the claim that cooperatives play critical roles in technology adoption can be accepted. To the best of the researcher's knowledge, there are few empirical studies in the literature that specifically assessed the effects of agricultural innovation systems on improving production of rural farmers in Nigeria context. Unfortunately, in the few studies that do exist, the analytical methods employed were mainly qualitative. This study is apt not only because it came at the time when the government is doing all it could to transform agriculture but also because of the need to capture the increasing role of cooperative societies in knowledge transfer. There is the need to understand the level of awareness of these agricultural innovations among cooperative and non-cooperative farmers, as well as understand the extent of adoption of agricultural innovation among cooperative and non-cooperative farmers. There is also the need to empirically determine the effect of agricultural innovation adoption on productivity of cooperative and non-cooperative farmers.

Objectives of the Study

The main objective of the study is to examine and also compare the determinants of agricultural innovations adoption among cooperative and non-cooperative farmers in Imo State, Nigeria.

Research Hypotheses

H_0: There is no significant difference in the determinants of adoption of agricultural innovations among cooperative and non-cooperative farmers.

METHODOLOGY
Research Design
The research design used in this study is descriptive survey. Here, data was gathered from a large number of respondents who constitute the sample to be the representative of the population of interest. These data collected were important in understanding the fact and events better and gives better interpretation and explanation, as well as make predictions about variables easy. In gathering the data, a cross-sectional research design was deployed whereby a one-time observation was made on the elements of the sample and on those variables which were relevant to this research.

Area of Study
The area of study is Imo State. It is one of the 36 states in Nigeria, set in the heart of Igbo land, and arguably the most strategic of the five States in South East Nigeria. The important cities in the State are Owerri, Okigwe and Orlu. it has an estimated population of about 4,769,239 as of 2006 (source: National Census Commission 2006).. The State shares boundary with Anambra in the North, Abia in the East and Rivers State in the South. The State Slogan is Heartland and It is currently referred to as the entertainment capital of Nigeria because of its high density of spacious hotels, high street casinos, production studios and high quality centres of relaxation. It is the home to an annual beauty pageant called "Miss Heartland". Owerri is the State capital. It was also the last of four capitals of the Republic of Biafra in 1969. The capital of the Secessionist State was continuously being moved as Nigerian troops captured the older capitals. The State sits in the rain forest and produces many agricultural products, such as yams, cassava, taro, corn, rubber and palm products. The State sits on huge crude oil and natural gas reserves like most of the Igbo land areas. Imo State has 27 Local Government Areas which are divided into three zones that is Orlu zone, Owerri zone and Okigwe zone. Orlu zone covers local government areas like Oguta, Orsu, Ideato North, Ideato south, Oru East, Oru West, Njaba, Nwangele, Nkwere, Isu, Umuna, Ohaji Egbema. In Okigwe zone we have these Local Government Areas: Okigwe, Onuimo, Isiala Mbano, Iheme, Ihiteuboma, Obowo, Umuna. Owerri zone has the following Local Government Areas: Mbaitoli, Ikeduru, Owerri Municipal, Owerri West, Owerri North, Ngor Okpala, Abor Mbaise, and Ezinihite. The State is agrarian in nature with over 60% of the population into one form of agriculture or the other. Farming took place more in rural areas and most of the farmers in the State belong to cooperatives popular crop, farming techniques, literacy level etc.

Population of the Study
The population of the study consists of all registered agricultural cooperatives in Imo State and non-cooperative farmers registered in the Ministry of Agriculture Imo State. From the data gotten from the State Ministry of Cooperative that is Ministry of Commerce and Industry in 2017, there was a total of 1184 registered agricultural cooperatives that are active and functional. The researcher has a total population of 2678 non-cooperative farmers, gotten from the register of All Farmers Association of Nigeria Imo State branch. These 1184 agricultural cooperatives have membership strength of 38,520. They all formed the population of the study.

Sample Size Determination and Sampling Technique
Multistage sampling technique was used in this study. All agricultural cooperatives in the area were categorized into the three agricultural zones in the state. . In stage one, the Local Government Areas that were predominantly agrarian, where these agricultural cooperatives were based was purposively selected from each of the three agricultural Zones: Owerri Zone, Orlu Zone and Okigwe Zone. In stage two, ten percent of the cooperatives in these Local Government Areas were selected using simple random sampling technique. Thirdly, ten percent of the members of these selected cooperatives were also selected using simple random sampling technique. The choice of 10% is supported by Alreck and Settle (1995) who states that it is seldom necessary to sample more than 10% of the population.

Due to the comparative nature of the study, 10% of active registered farmers in the local governments were also selected. These farmers live in the same areas the selected cooperatives members live and share similar socio-economic characteristics.

Table1. Showing Agricultural Zones, Number of Cooperatives and members selected

Zones	No. of Agricultural Cooperatives	No of members	No. of registered individual farmers	No of cooperative selected	No of members selected	No of registered individual selected
Owerri						
Ikeduru	24	720	610	2	72	61
Ezinihite	21	714	628	2	71	62
Ngor Okpala	25	820	510	3	82	51
Okigwe						
Obowo	29	928	483	3	92	48
Onuimo	21	630	539	2	63	54
Iheme	21	642	436	2	64	44
Orlu						
Njaba	26	782	546	3	78	55
Nkwere	24	689	490	2	68	49
Oru West	22	609	473	2	60	47
Total	213	6534	4715	21	653	471

To determine the sample size, Taro Yamani formular was used.
The formular was n= N/1+N(e)²
Where n = desired sample size

N = population generated for the study
E = Acceptable error limit (0.05%)

Substituting the formular for Cooperative Farmers,
653/1+ (653 X 0.0025) = 248

Substituting the formular for Non-cooperative Farmers
471/ 1+(471 x 0.0025) = 216

Sources of Data
Two main sources of data were employed to gather data for this study. These are secondary and primary sources: (1) Secondary Sources: Secondary data were sourced from already existing materials such as textbooks, government publications and bulletins, journals, unpublished theses and dissertations, discussion papers, etc. (2) Primary Sources: First-hand data were collected from primary sources. The main instrument for this task was structured questionnaire which contained uniform questions made up of appropriate combination of Likert formatted and some open ended questions which were administered on all the respondents.

Instrument for Data Collection
The instrument used for data collection is a structured questionnaire designed by the researcher, in line with the objectives of the study. Information obtained was with respect to socio-economic characteristics of the farmers such as age, gender, education, farm size, household size, and income. Other information obtained included responses about their adoption behaviour and their productivity behaviour.

Data for evaluation of effect of adoption was obtained through the employment of Likert-type scale with five levels: Strongly Agree (5); Agree (4); Undecided (3); Disagree (2); and Strongly Disagree (1) to obtain responses from the respondents. The cooperative members were requested to indicate their level of agreement with each of the items relating to savings pattern in the questionnaire. A total of 248 copies of questionnaires were distributed to cooperative farmers while 216 were distributed to non-cooperative farmers. However, only 206 were dully filled from cooperative farmers and 196 for non-cooperative farmers.

Method and Tools for Data Analysis
Descriptive statistics such as frequency distribution, means and percentages was used to analyze the data obtained to address the objectives of the study. Also inferential statistics, such as One-Way Analysis of Variance (ANOVA), t-test and regression was employed to address the research questions and to test the promulgated hypotheses. Specifically, mean rating and descriptive statistics were used to address the research questions, while ANOVA, t-test was used to test the hypotheses at 5% level of significance.

Objective number one was achieved using one-way ANOVA.

Decision Rule: Accept the null hypothesis if the f-value is not significant (f > 0.05)
Objective number two was achieved using t-test

DATA PRESENTATION AND ANALYSIS
Socio-Economic Characteristics of the Respondents
In this chapter, data collected were presented and analyzed. Research questions and hypothesis were respectively answered and tested based on the data collected.

Table 2: Socio-economic characteristics of cooperative and non cooperative farmers studied.

Variables	Frequency	Percentage (%)
Sex		
Male	164	41
Female	238	59
Total	402	100.00
Age		
Less than 25	41	10
26- 40	111	28
41-65	184	46
Above 65	66	16
Total	402	100.00
Marital status		
Single	91	23
Married	194	48
Widowed/divorced	116	29
Total	402	100.00

Farm size		
Less than I hectare	152	38
3 hectare	187	47
Above 3 hectare	63	15
Total	402	100.00
Educational qualification		
No formal education	45	11
Primary	172	43
Secondary	108	27
Tertiary	77	19
Total	402	100.00
Household size		
1-3	53	13
4-6	94	23
7-9	158	39
10-12	73	18
Above 12	24	5
Total	402	100
Years of cooperative membership		
Non members		
0-5 years	196	49
6-10 years	54	13
11-15 years	96	24
16-20 years	33	09
Above 21 years	20	05
Total	402	100
Output		
Less than 1ton	44	11
1-3 tons	168	42
4-10 tons	141	35
Above 10tons	49	12
Total	402	100
Annual income		
Less than 500,000	53	13
500,001 – 1 million	166	41
1 m- 3 million	123	31
Above 3 million	60	15
Total	402	100

Source: Field Survey, 2018

Socio-economic profile of the respondents as shown in Table 2 reveals that 59% of the respondents were female while 41% were male. The blend of both male and female was proportionate as there were more females than males in most cooperatives that operate in the area studied. About 84% of the respondents belong to active population bracket (25-65 years). Ten percent of the sample selected was less than 25 years old while 5% were above 65 years. In terms of marital status, 23% of the respondents were single, while 48% were married. Surprisingly, 29% were widowed /divorced. Majority of respondents had more than three hectares of land. Thirty percent cultivate less than three hectares whereas 15% worked on more than three hectares. Result showed that over 80% of the respondents had formal education. Nineteen percent attempted tertiary education, while 11% did not attempt any formal education. Furthermore, the profile showed that majority of the respondents had large household size. Sixty-two percent had 4-9 persons in their household, whereas only 13% had 1-3 persons. Table 2 revealed that 41% of the respondents do not belong to cooperative societies, while 51% were cooperative members. Majority of the farmers who belonged to cooperative have spent between 6-10 years in the cooperative. In terms of volume of agricultural production of the respondents, 77% produce between 2-10 tonnes. Annual income profile of the respondents showed that 72% earn between 500,000 – 3 million naira. Thirteen percent earn less than 500,000, while 15% earn above 3 million naira.

Table 3: Determinants of agricultural innovation adoption among cooperative and non cooperative farmers

Determinants	Mean (Cooperative) $(\bar{X})$	Remark (Cooperative) $(\bar{X})$	Mean (Non - Cooperatives) $(\bar{X})$	Remark (Non cooperative) $(\bar{X})$
Education Level	4.2	Accepted	4.51	Accepted
Annual Income	4.9	Accepted	4.3	Accepted
Farm experience	4.39	Accepted	3.4	Accepted
Frequency of contact with extension staff	3.87	Accepted	3.93	Accepted

Cooperative Membership	3.92	Accepted	3.63	Accepted
Farm size	3.2	Accepted	2.47	Rejected
Price of the produce	3.3	Accepted	3.2	Accepted
Type of Media	4.1	Accepted	3.8	Accepted
Government policy	3.9	Accepted	3.6	Accepted
Source of funding	2.8	Rejected	3.2	Accepted
Availability of success stories	4.8	Accepted	4.5	Accepted
Market value of farm assets	2.7	Rejected	2.9	Rejected
Frequency of training	4.31	Accepted	3.92	Accepted
Attitude to novel ideas	3.82	Accepted	4.0	Accepted
Household size	3.52	Accepted	3.71	Accepted
Extent of livelihood diversification	3.78	Accepted	3.3	Accepted
Location of the farmers	2.48	Rejected	3.4	Accepted
Availability of markets	3.2	Accepted	3.6	Accepted
Motive for farming	2.73	Rejected	2.51	Rejected
Parents' occupation	3.2	Accepted	3.3	Accepted

Source: Field Survey, 2018

Table 3: reveals that important determinants of adoption include educational level, annual income, farm experience, frequency of contact, cooperative membership, price of the produce, type of media used, government policy, availability of success stories, frequency of training, attitude to novel ideas, household size, extent of livelihood diversification, availability of markets and parents occupation. Interestingly, farm size, market value of farm assets, location of farmers and motives for farming were not important determinants of adoption of agricultural innovation in the area studied.

Hypothesis 1

Ho: There is no significant difference in determinants of adoption of agricultural innovation among cooperative and non-cooperative farmers.

Table 4: ANOVA table (One way) comparing determinants of agricultural innovation adoption among cooperative and non-cooperative farmers

		Sum of Squares	Df	Mean Square	F	Sig.
Attitude to novel ideas	Between Groups	1.752	5	.350	1.436	.209
	Within Groups	144.873	397	.244		
	Total	146.625	402			
Education	Between Groups	35.108	5	7.022	1.088	.366
	Within Groups	3832.611	397	6.452		
	Total	3867.718	402			
Farm size	Between Groups	44.960	5	8.992	5.699	.210
	Within Groups	693.734	397	1.168		
	Total	738.693	402			
Frequency of contact	Between Groups	7.382	5	1.476	3.082	.109
	Within Groups	284.511	397	.479		
	Total	291.893	402			
Availability of markets	Between Groups	15.624	5	3.125	4.257	.061
	Within Groups	436.001	397	.734		
	Total	451.625	402			
Membership of cooperative	Between Groups	28.195	5	5.639	5.985	0.910
	Within Groups	372.803	397	.628		
	Total	400.998	402			
Location of the farm	Between Groups	13.888	5	2.778	1.254	.282
	Within Groups	1315.710	397	2.215		
	Total	1329.598	402			
Farm experience	Between Groups	16.030	5	3.206	1.569	.027
	Within Groups	1213.803	397	2.043		
	Total	1229.833	402			
Price of the produce	Between Groups	195.541	5	39.108	3.490	.100
	Within Groups	911.332	397	1.534		
	Total	1106.873	402			
Motive for farming	Between Groups	1.398	5	.280	1.229	.094
	Within Groups	135.076	397	.227		
	Total	136.473	402			
Parents occupation	Between Groups	4.035	5	.807	2.385	.087
	Within Groups	200.950	397	.338		
	Total	204.985	402			

Type of media in use	Between Groups	11.944	5	2.389	2.111	1.03
	Within Groups	672.254	397	1.132		
	Total	684.198	402			
Household size	Between Groups	5.548	5	1.110	1.368	.234
	Within Groups	481.645	397	.811		
	Total	487.193	402			
Annual income	Between Groups	28.710	5	5.742	3.133	.008
	Within Groups	1088.783	397	1.833		
	Total	1117.493	402			
Training attendance	Between Groups	18.366	5	3.673	2.171	.066
	Within Groups	1004.967	397	1.692		
	Total	1023.333	402			
Source of fund for farming	Between Groups	5.920	5	1.184	1.143	.336
	Within Groups	615.273	397	1.036		
	Total	621.193	402			
Value of productive assets	Between Groups	13.003	5	2.601	4.653	.720
	Within Groups	331.956	397	.559		
	Total	344.958	402			
Success stories	Between Groups	7.330	5	1.466	3.689	1.03
	Within Groups	236.055	397	.397		
	Total	243.385	402			
Attitude of extension agents	Between Groups	21.271	5	4.254	2.317	.092
	Within Groups	1090.794	397	1.836		
	Total	1112.065	402			
Literacy level of farmers	Between Groups	13.646	5	2.729	3.758	.082
	Within Groups	431.419	397	.726		
	Total	445.065	402			

Source: Field Survey, 2018

ANOVA table in Table 4 revealed that determinants of adoption were same for both cooperative and non-cooperative farmers. The hypothesis tested was not significant at 5% level. Therefore, we accept the null hypotheses and conclude that there is no significant difference in determinants of adoption of agricultural innovation among cooperative and non-cooperative farmers.

Findings and Recommendations
Important determinant of adoption include educational level, annual income, farm experience, frequency of contact, cooperative membership, price of the produce, type of media used, government policy, availability of success stories, frequency of training, attitude to novel ideas, household size, extent of livelihood diversification, availability of markets and parents occupation. Determinants of agricultural innovation adoption were also the same for cooperative and non-cooperative farmers. Based on the findings made in the study, the study recommends that cooperative extension services need to be revolutionalized and given adequate attention. This can be achieved by developing new framework for cooperative extension and forging a common ground for both cooperative and agricultural extension work. Apart from recruitment and deployment of competent and well motivated staff, there is the need for provision of work gadget and work tools that are in tune with technological changes. Supervision and retraining of extension staff should also become a priority.

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