TECHNOLOGY ADOPTION AND COCONUT PRODUCTION AMONG FARMERS IN MKPAT-ENIN LGA IN AKWA-IBOM STATE, NIGERIA

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ABSTRACT

This study assessed the relationship between technology adoption and coconut production among Farmers in Mkpat-Enin LGA in Akwa-Ibom State, Nigeria. The study utilized primary data, which were collected through the use of copies of a structured questionnaire which was distributed to 384 small holder coconut farmers in the LGA. The study was anchored on Technology Acceptance Model (TAM). Descriptive statistics were used to present and discuss data, while a regression analysis model to test formulated hypotheses at the 5% level. The results of the study revealed that new positive relationships between adoption of new coconut seed varieties and coconut yield and between use of coconut extension services and coconut yield. The study recommends among others, that government should complement the efforts of the coconut growers in the procurement of not just high-yielding coconut seeds but also in the procurement of other coconut farm inputs such as organic manures and fertilizers, which literature has shown are also critical determinants of coconut output.

Keywords: High yield coconut seeds, Coconut extension services, TAM model.

1.1 INTRODUCTION

Coconut is one of the most important crops grown in more than 93 countries in the world in an area of 12.19 million ha, with an annual production of 61.165 million nuts equivalent to 13.59 million tons of copra. More than 11 million farmers, mostly smallholders with low income, grow the palm in 90 countries (FAO, 2009). Indonesia is the largest coconut producing country, with an area of 3.8 million ha and annual production of 3.77 million tons of copra, followed by the Philippines with an area of 3.3 million ha and annual production of 2.49 million tons of copra. India, with 1.9 million ha and annual production of 2.74 million tons of copra, occupies third place. However, the global increase in coconut production is mainly associated with increase in area under cultivation over the years (Adkins, 2006).

In Africa, Tanzania is the largest coconut producer while Nigeria is the 11th (Ogunlade, 2011). Certainly, coconut is a national crop in Nigeria and can grow in over 26 states of the federation's coastal zone which runs through seven of the Southern States of the Federation which includes; Lagos, Ondo, Delta, Bayelsa, Rivers, Akwa Ibom and Cross Rivers bordering the Atlantic Ocean. The continental shelf widens progressively from the western region of 35km in the area of Lagos, 64km around the Cape of Forcados in the Niger Delta area to a maximum of 75km offshore

Calabar. According to the survey by the National Agricultural Extension Research and Liaisons (NAERL, 2011), the leading coconut producing states in Nigeria includes; Niger, Kano, Jigawa, Zamfara, Kebbi, Sokoto, Katsina, Kaduna, Adamawa, Yobe, Borno, Taraba, Plateau, Nasarawa, Bauchi, and Gombe.

The area under coconut production in the country is estimated to be about 265,000 ha with an estimated population of five hundred thousand palms that produces 50 million nuts annually, equivalent to about 9,300 metric tonnes of oil and capable of generating 10 billion Naira in revenue annually (Nnoli, 2012). In monetary terms, the value of the current coconut production from the sales of fresh nuts at farm gate price is ranging between 100 and 200 Naira. However, local consumption of fresh nuts without entering the formal market channels has reduced the amount of income accrued from coconut production (MARI, 2012). Coconut is an important oil crop that supports the livelihoods of about ten thousand people living in coastal belt areas of Nigeria (NBS, 2012). Nnoli (2012) has noted the area under coconut production in the country is estimated to be about 265000 ha with an estimated population of five hundred thousand palms that produces 50 million nuts annually, equivalent to about 9300 metric tonnes of oil and capable of generating 10 billion naira in revenue annually. Apart from its bearing supports to livelihoods as the major source of income for the coastal belt, coconuts are preferred due to its adaptability and ability to provide acceptable yields under marginal farming condition (MARI, 2012). It is against this backdrop that the Federal Government of Nigeria has developed special attention on the crop and agricultural sector at large. with the main targets of promoting investment, production and productivity as well as ensuring food security (URT, 2002).

Coconut is an important oil crop that supports the livelihood of majority of coastal people in Nigeria and the sustainability of their environment. It is referring as to the *Tree of Life* because of the many products that can obtain from one tree crop. However, this has not been the case and poverty continues to loom despite the many products that accrue from the crop (Mwachiro and Gakure, 2011). Despite the enormous potential of the crop, coconut farmers in Nigeria are poor and lack adequate resources to invest in technologies that would improve production (MARI, 2012). To unlock this potential, the Government of Nigeria initiated the National Coconut Producers Processors and Marketers Association of Nigeria (NACOPPMAN) and the Coconut Research Institute of Nigeria (CORIN) in 2018 with the major goal of improving the productivity of the coconut sub-sector through a number of research and development activities (MARI, 2012). The NACOPPMAN put in forth a sound scientific, technical and infrastructure capacity in research for the development of the coconut sub-sector. A number of production and processing technologies were developed, disseminated and also adopted by farmers.

However, production remains low when compared to major coconut growing countries in spite of the efforts of the federal government to ensure that assorted improved technologies are adopted. Perhaps, the problem could be that small scale farmers are not getting appropriate attention in terms of available technology and other logistics in coconut production milieu such as new coconut seed varieties, coconut extension services, etc., that could propel them to higher production and productivity.

Mkpat-Enin Local Government Area is home to the newly established coconut refinery with a substantial number of small holder coconut farms. These farms will definitely play a leading role in the supply of nuts to the coconut refinery, along with the coconut plantations that are being established in most local government area by the state government. However, with paucity of empirical evidence, little is known about the capacity and capability of small holder coconut farmers in the area in living up to this expected role. Indeed, a study is particularly needed to ascertain why farmers do not increase production of coconut despite the adoption of improved agricultural technologies.

Therefore, this study determines the nexus between adoption of improved technologies in coconut production among smallholder farmers in Mkpat-Enin LGA of Akwa-Ibom State Nigeria. Specifically the study seeks to examine the relationship between adoption of new coconut seed varieties and coconut output of farmers; and determine the relationship between use of agricultural extension services and coconut output farmers.

In line with the above objectives, we hypothesize, in null forms, that: i. adoption of new coconut seed varieties is not significantly related to coconut output of farmers; and ii. Use of coconut extension services is not significantly related to coconut output farmers.

2. REVIEW OF RELATED LITERATURE

2.1 Technology Adoption

Mitropoulos and Tatum (2000) defined technology adoption as a process by which an individual or organization identifies and implements a new technology. This process starts from awareness to continued use of the innovation, which results into perfect relationship between intention and behavior of adoption (Gollwitzer, 1999). Doss (2003), who conducted a study on farm-level technology adoption in Eastern Africa, came with distinction between discrete and continuous technology adopters among typical farmers who use either unimproved or improved inputs. The author defines a farmer as being an adopter if he or she is found to be using any improved materials. With respect to the adoption of improved varieties, discrete adoption refers to a farmer who stops using a local (traditional) variety and adopts an improved variety. In contrast, continuous adoption refers to situations where farmers increasingly planting more land to improved varieties, while continuing to grow some local varieties (Lopes, 2010).

Adoption of any innovation is not a one step process as it takes time for adoption to complete. First time adopters may continue or cease to use the new technology. The duration of adoption of a technology vary among economic units, regions and attributes of the technology itself. Therefore, adequate understanding of the process of technology adoption and its diffusion is necessary for designing effective agricultural research and extension programmes. However, adoption and diffusion are distinct but interrelated concepts. Adoption commonly refers to the decision to use a new technology or practice by economic units on a regular basis. Diffusion on the other hand refers to spatial and temporal spread of the new technology among different economic units. Many researchers belonging to different disciplines have defined the two concepts in relation to their own fields (. Among others, the definition given by Rogers (1983) is widely used in several adoption and diffusion studies. Rogers (1983) made a distinction between adoption and diffusion. He defined diffusion (aggregate adoption) as the process by which a technology is communicated through certain channels over time among the members of a social system1. This definition recognize the following four elements: (1) the technology that represents the new idea, practice, or object being diffused, (2) communication channels which represent the way information about the new technology flows from change agents (extension, technology suppliers) to final users or adopters (e.g., farmers), (3) the time period over which a social system adopts a technology, and (4) the social system. Rogers (1983) then defined adoption as use or nonuse of a new technology by a farmer at a given period of time. This definition can be extended to all economic units in the social system.

Coconut Varieties

2.2 Coconut Varieties

Coconut trees are classified by the location where they are grown, assuming that some uniformity in the population is developed in one location across several generations, adapting to drought, high rainfall, alkaline soil or resistance to various insects and diseases long established in the specific location. This is why they are sometimes classified as West African Tall, Malayan Tall and such.

Indeed, they can be classified according to the size and stature of the palm, and are referred to as Talls and Dwarfs. In Tanzania, Muyengi, Msuya and Lazaro (2015) identified three major major varieties of coconut palms are grown farmers including East African Tall, Dwarfs and Improved varieties. The East African Tall (EAT) is the most predominant coconut population in the country. It can produce 40 to 80 nuts per year. Improved variety of the East African Tall can produce 80 to 120 nuts per year. The local dwarf commonly known as the Pemba Red Dwarf (PRD) can produce 30-70 nuts per year. Yun (2019) equally classified coconut into varieties of Malayan Tall, Malayan Yellow Dwarf, Malayan Red Dwarf and Pandan Tetra Pak, 2020). Coconuts palms are also monoecious. In other words, they consist of male and female flowers on the same inflorescence (spadix) that develops within a woody spathe. Depending on the variety of the coconut trees, the male and female flowers develop at same or different times. As the coconut tree is propagated by seed, they are subjected to some variations which can be distinguished in the trees, fruits and leaves. As such, there are hundreds of vernacular names for the coconut types.

In Nigeria, Odewale, J., Okoye, M., Odiowaya, G., Ahanon, J. & Agho, C. (2013) note that Malayan green dwarf (MGD), Malayan yellow dwarf (MYD), Malayan orange dwarf (MOD), West African tall (WAT) and Hybrid (HY) are varieties that are available in Nigeria. However, most small holder coconut farmers are appear to favour WAT.

Tall coconut palms are usually cross-pollinated, and are subjected to the most variations. Tall coconut palms have longer economic lives than Dwarf trees, typically about 60-80 years, and can live up to 100 years old under favourable conditions. They also have larger fronds than Dwarf trees, so fewer Tall coconut trees can be planted per hectare of land. Tall coconut palms are also fairly resistant to diseases and pests, except some virus diseases, and thrive under different soil conditions. After six to eight years of planting, Tall coconut palms will begin to bear fruits. Although Tall coconut trees are usually the choice for small holder farmers in Nigeria, Dwarf varieties are also available.

Dwarf coconut palms are mostly self-pollinated, and have fewer variations compared to Tall varieties. They are classified by the colour of the coconut fruits produced. As the name suggests, Dwarf coconut palms are smaller in stature than Tall varieties. Dwarf coconut palms have shorter economic lives than Tall palms and only live up to 60 years old. With smaller fronds, more Dwarf coconut trees can be planted per hectare of land. Compared to Tall coconut trees, Dwarf varieties cannot adapt as well to different soil conditions, and are more susceptible to diseases, although they do show good resistance to some virus diseases. However, they begin to bear fruits earlier, after only three years of planting. At about 10 years old, they come into regular fruiting. Similar to Tall varieties, the bigger the coconuts, the lesser number of fruits found per bunch. The dwarfs smaller and shorter so they are easier to harvest: and the yields are very high

Hybrids are inter-varietal crosses between two morphological forms of coconut trees. In particular, hybrids from Dwarf and Tall, Tall and Tall varieties also produce high-yielding coconut palms. In general, hybrid coconut palms are more superior in terms of quality and quantity of copra production. They also contain the greatest amount of copra per nut. As such, they are usually selected for commercial planting. The hybrid crosses between Dwarf and Tall varieties have exhibited marked hybrid vigour by having the advantages found in both palms. As such, high yielding hybrid coconut trees are resistant to environmental stress, including drought and diseases. They also bear fruits after three to four years of planting. Compared to Dwarf and Tall varieties, hybrid coconut palms have more nut yields and higher copra production. The copra and oil produced are also of better quality.

2.3 Coconut extension

Coconut extension is an extension service extended to coconut growers to assist them with modern procedures in coconut farm management. It is the application of scientific research and innovation to coconut farming and production management.

Certainly, extension is a term which is open to a wide variety of interpretations (Oakley & Garforth, 1985). Each extension agent probably has his own understanding of what extension is. This understanding will be based on past experience and the particular type of extension service in which the agent is working. In other words, there is no single definition of extension which is universally accepted or which is applicable to all situations. Furthermore, extension is a dynamic concept in the sense that the interpretation of it is always changing. Extension, therefore, is not a term which can be precisely defined, but one which describes a continual and changing process in rural areas.

Generally, agricultural extension can be defined as the "delivery of information inputs to farmers"(Anderson and Gershon, 2007). The role of extension services is invaluable in teaching farmers how to improve their productivity. Extension is also critical to move research from the lab to the field and to ensure a return on investment in research by translating new knowledge into innovative practices. (Davies, Baulcombe, Crute, Dunwell, Gale, Jones, Petty & Toulmin, 2009).

Extension services are classified into 3 types: (Beynon, Akroys, Duncan, & Jones, 1998)

- Technology transfer: the traditional model of the transfer of advice, knowledge and information in a linear manner;
- Advisory: the use by farmers of a cadre of experts as a source of advice in relation to specific problems faced by them;
- Facilitation: the aim of this model is to help farmers to define their own problems and develop their own solutions.

Undoubtedly, extension is responsible for the transfer of agricultural technologies to farmers, and to convince farmers to adopt modern agricultural techniques. The transfer of agricultural technologies can be done through many stages. It is the bridge that connects farmers with agricultural research centers in order to transfer all agricultural techniques to farmers and teach them how to use them in their farms.

Empirical Review

Improved technologies in coconut production have been observed to increase nut yields elsewhere. The increased yield through utilization of improved technologies, in turn increases income among coconut farmers (URT, 2000). For example, a major problem facing the Philippines coconut industry was high incidence of poverty among coconut farm families. However, after introduction of some technologies, the level of poverty started declining through improved coconut yield

(Aragon, 2000). On the other hand, high prices of improved technologies hinder the poor farmers to afford the technologies. This has, in some instances, made the poor farmers continue having low coconut production. In addition, Rodriguez (2007) found that the low income of coconut farm can be attributed to one or a combination of the following factors: low coconut yields, low prices of farm produce, a limited market, and underutilization of coconut land and high cost of farm inputs. In a similar study, Negash (2007) examined the reasons for low production and productivity in Ethiopia. His findings show that low coconut productions in the area were mainly associated with poor adoption of improved technologies and poor marketing system.

Ruvani (2018) determined the level of technology adoption to manage major coconut pests by the coconut farmers in different land categories. The farmers were selected from the Kurunegala district, which is the major coconut growing district in coconut triangle in Sri Lanka. Findings of the study revealed that more than 70 percent of the growers in all land categories above 2Ac had adopted technologies recommended by CRI to control black beetle. Technology adoption level was around 60 percent for red weevil control, nearly 30 percent for coconut mite and around 65 percent for plesispa beetle. Farmers' perceptions affect their technology adoption decisions. It was also found that unawareness of technologies and low attention for coconut farming were the two major reasons for poor adoption levels of the recommended technologies. The author suggested a way out of identified adoption challenges, could be strengthening of farmer level extension programs in the area.

Selvarajah and Geretharan (2013) investigated the factors that influence the adoption of improved coconut management practices in Batticaloa district. A random sample of 100 coconut growers was interviewed for this purpose. Logit model was used to estimate the relationship of adoption decision and the socioeconomic factors of farmers. Results showed that that size of farm land, age, membership in social organization and participation in organization activities are the most significant factors affecting the adoption of improved coconut management practices.

Mahindapala (2018) noted that lower adoption of coconut technologies by farmers in Sri Lanka was due to the fact that farmers were primarily not convinced about the derivable benefits.

Obviously there is a paucity of empirical studies on technology adoption and coconut production. The few that exist are studies carried out in other climes. This therefore strengthens the resolve to carry out the present study to contribute to filling the research gap.

2.5 Theoretical Framework

The study is based on Technology Acceptance Model (TAM). TAM is a widely utilized theoretical framework for the assessment of how people make decisions regarding new technology adoption. TAM has frequently been used for information systems and other fields (Davis, 1989). TAM is useful when a study focuses on the potential adoption of an emerging technology, such as behavior of farmers in their choice of coconut technology (Koul & Eydgahi, 2017).

The goal of TAM is to predict user acceptance and highlight potential design issues before users of the technology interact with the system (Mohd, Ahmad, Samsudin, & Sudin, 2011). TAM was developed with support from IBM Canada and is rooted in the basic psychological theory known as the Theory of Reasoned Action (Ajzen & Fishbein, 1980). As shown in Figure 1, TAM demonstrates a pioneering research effort by generating a framework for explaining behavioral intentions and actual behavior of users for new technology adoption.

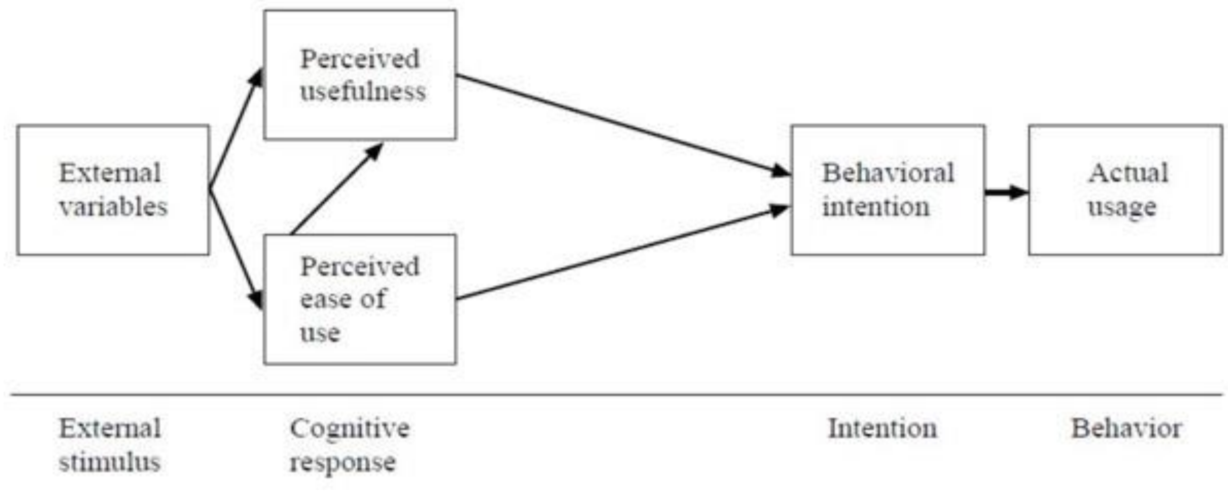

Figure 1. TAM model. Adapted from Davis & Venkatesh, 1996, p. 20.

Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the perceptions of the beliefs users hold about the system. Davis (1989) defined PU as "the degree to which a person believes that using a particular system would enhance his or her job performance" and PEOU as "the degree to which a person believes that using a particular system would be free of effort.

Technology Acceptance Model is germane to this study in the sense that coconut growers may not adopt the presented technology adoption unless the perceived benefit, in terms of significant increase in yields and ease of application of the technology is not complex.

3. METHODOLOGY

3.1 Research Design

The study adopted survey research design. Survey design is one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group. It specifies how such data were collected and analyzed. This method was chosen for data collection, because it enabled the researcher to solicit for information that might not be available on the pages of the text book.

Population of the Study& Sample Size

The population of the study is made up of all coconut farmers in Mkpat Enin LGA in Akwa Ibom State. Due to unavailability of reliable record of coconut farmers in the LGA, the population of the studies is defined as infinite.

Since the population of the study has been defined as an infinite one, the infinite population formula (with proportional allocation between groups) to determine the sample size (Godden, 2004):

$$SS = \frac{Z2 \times (p) \times (1 - p)}{C2}$$

Where:

SS = Sample Size for infinite population (of more than 50,000).

Z = Z-value (e.g., 1.96 for a 95 percent confidence level)

P = Population proportion (expressed as decimal) (assumed to be 0.5 (50%) since at least 5 in ten farmers in the area are in one way or the other involved in coconut farming and this would provide the maximum sample size).

M = Margin of error at 5% (0.05).

Using 95% confidence level, the sample size is as follows:

$$SS = \frac{1.962 \times (0.5) \times (1-0.5)}{0.0025}$$

$$= 384.16 \text{ Approx. } 384.$$

Multistage and systematic sampling techniques were adopted. The stage one of the sampling processes involved purposive selection of four villages from each of the four clans (Ikpa Ibom, Ukpum Minya Ikpa Ikono and Ibiaku) that make up the LGA. The four clans are made up of 81 villages.

In stage two, 16 villages representing 20% of the entire 81 villages that make up the four clans in the LGA (four from each clan) were randomly selected. In stage three, which is the final stage, 24 four coconut farmers were randomly picked from lists of previously identified coconut farmers in each of the selected 16 villages, to obtain a total sample of 384.

Source of Data Collection

The researcher explored two sources of data which are the primary and secondary data. The primary data were obtained from farmers who were engaged in oil palm production in Anambra State.

The secondary data were obtained from existing literature in the field of study which was available to the researcher, such as: journals, text books, internet materials, unpublished write-ups etc.

3.2 Method of Data Collection/Instrument

Data for the study were collected from primary source. The primary data were generated through the use of structured questionnaire to elicit required information. Copies of structured questionnaire were administered and the participants were placed on objective response for each statement on a Likert scale. A 5 point Likert scaled questionnaire was used in collecting relevant data for the study; it was arranged ranging fromStrongly Agree (5), Agree (4), Undecided (3), Disagree (2) and Strongly Disagree (1). A cut point of 3.0 was adopted as the criterion mean. This implies that any mean score that is 3.0 and above was considered as Agree while mean score below 3.0 was considered as Disagree.

3.3 Validity of and Reliability of the Instrument

The face and content of the validity were ensured by giving out copies of questionnaire, research objectives and hypotheses to research and measurement expects in the Faculties of Management Sciences and Agriculture, Nnamdi Azikiwe University Awka for critiques and suggestions.

The reliability of the research instrument was established using the responses of 20 cononut from Ikpa Ibom clan, who are not part of the selected sample using a test re-test method. The reliability of the instrument was established using test re-test technique. The application of Pearson Product Moment Correlation Coefficient yielded 0.915, indicating very high reliability.

3.4 Method of Data Analysis

The data collected were analyzed using descriptive statistics; frequency counts, percentage, and mean scores and standard deviation to answer research questions while inferential statistics such as Pearson Product Moment Correlation analysis was applied to test the stated hypotheses.

4. DATA PRESENTATION AND ANALYSIS

4.1 The socio-economic characteristics of the respondents.

The table below shows the socio-economic characteristics of the respondents.

Table 1 Socio-Economic characteristics

	Item	Respondents	Percentage
1	**Gender**		
	Male	264	68.75
	Female	122	31.25
	Total	**384**	**100.00**
2	**Age distribution**		
	20-29	28	7.29
	30-39	124	32.29
	40-49	75	19.53
	50-59	98	25.52
	60-69	59	15.37
	Total	**384**	**100.00**
3	**Marital status**		
	Single	31	8.07
	Married	297	77.34
	Widowed/divorced	56	14.59
	Total	**384**	**100.00**
4	**Family size**		
	0-5	120	31.25
	6-10	156	40.63
	11-15	56	14.58
	16-20	52	13.54
	Total	**384**	**100.00**
5	**Education level**		
	Not been to school	120	31.25
	Primary school	98	25.52
	Secondary	103	26.82
	Tertiary institution	63	16.41
	Total	**384**	**100.00**

6	**Income (N'000)**		
	100-200	56	14.58
	200-300	120	31.25
	300-400	140	36.46
	400-500	48	12.50
	500 and above	20	5.21
	Total	**384**	**100.00**
7	**Farming experience (years)**		
	0-3	54	14.06
	4-7	166	43.23
	8-11	164	42.71
	Total	**384**	**100.00**
8	**Farm size in (Ha)**		
	1-2	130	33.85
	3-4	115	29.95
	5 and above	139	36.20
	Total	**384**	**100.00**

Source: Survey data, 2019.

The socio economic characteristics of sampled coconut farmers are summarized and presented in Table 1. The result shows that the majority (32.29%) of the respondents were within the age range of 30-39 years, 19.53% fell in the age range of 50-59; and 13.0% were in the age range of 20-34 years while 19.53% belong to the age range of 40-49. The finding suggests that, majority of respondents were still in their active age, suggesting that they still the possess the strength to be active farmers. The distributions of respondents according to gender highlight that majority of the respondent (68.75%) were male while 31.25% were female. This finding suggests that coconut farming in the area is dominated by men. The result further revealed that, 77.33% of the respondents were married, while 14.59% were widowed and 8.07% were single.

The distribution of formal educational status of respondents revealed that 16.41%, 26.82% and 25.52% had formal education up to tertiary, secondary and primary education respectively. Only 31.25% of the respondents had no formal education. Given the number of years of acquisition of formal education by majority of the respondents, it implies that the farmers possess the capacity to adopt coconut production technologies in their farms.

The income distribution of the respondents indicated that 36.46% of the respondents earn between N300,000 and N400,000 per annum, 31.25% earn between N200,000 and N300,000 annually, while only 5.21% earn N500,000 and above annually. Indeed, the salary ranges are modest and indicates fair financial capability of the coconut farmers. The farming experience distribution of the coconut farmers showed a majority of them (43.23%) had 4-7 years' experience, 42.71% had 8-11 years' experience while 14.06% had between 0-3 years' experience. Thus, the respondents are quite experienced in coconut farming and this would impact positively on their disposition towards adopting necessary production technologies in their coconut farms. The farm size of a majority (36.20%) of the coconut farmers were at least five hectares. However, 33.85% of the respondents had coconut farms of between 1 and 2 hectares. Nevertheless, 32.65% of the farmers had coconut farm sizes that range from 3-4 hectares; while the remainder (29.95%) had coconut farm sizes that were over 5 hectares. This then shows that most of the respondents were small scale farmers, who will obvious need assistance of the government to enable them adopt new production technologies in their coconut farms.

4.2 Adoption of New Coconut Seed Varieties by Farmers

To determine the perception of coconut farmers on the adoption new coconut seed varieties by cultivators in the area, a Likert scale of 10 statements was constructed. The responses of the farmers are presented in table 2.

Table 2: Farmers adoption of new coconut seed varieties (n=384).

S/N	Item	Mean	Std Dev.	Decision
1	Farmers in the LGA always use improved coconut seedlings on their farms	3.2388	.47574	Agree
2	Improved coconut seedlings are always available in the LGA office	3.1612	.5115	Agree
3	Imp roved coconut seedlings are sold to farmers by the Akwa Ibom State government at affordable rates	3.2306	.53339	Agree
4	Coconut seedlings are available in all seasons of year.	3.0967	.54335	Agree
	GRAND MEAN	3.2259	.32589	Agree

Source: survey data, 2020.

Information in table 1 showed that the respondents acknowledged the availability and use of improved coconut seedlings by farmers in the area. Clearly, their responses were indicative of this: Farmers in the LGA always use improved coconut seedlings on their farms (3.24); Improved coconut seedlings are sold to farmers by the Akwa Ibom State government at affordable rates I purchase much of my needed farm inputs from the village cooperative store (3.34); cooperative assists us to get better prices for our farm produce (3.23); (3.26); and Improved coconut seedlings are always available in the LGA office (3.16). The grand mean of the responses was also above the theoretically accepted score of 3.0.

4.3 Availability and Use of Coconut Extension by Farmers

Coconut farmers' perceptions on the availability and use of coconut extension services in their farms were determined through the application of Likert scale procedure. The findings are presented in table 3.

Table 3: Availability and use of coconut extension service in the area (n=384)

S/N	Item	Mean	Std Dev.	Decision
1	Agricultural extension services are always available for coconut farmers when they need them.	3.6759	.95930	Agree

2	Coconut extension services are available at no cost to the farmer.	3.8839	1.11259	Agree
3	Farmers are made aware of available high breed coconut seeds, chemicals and pesticide.	3.6265	.90639	Agree
4	Extension services create awareness among coconut farmers of latest technology in coconut farming	3.7612	1.02368	Agree
5	Through extension, coconut farmers are advised on correct coconut planting procedures	3.8918	1.11238	Agree
	GRAND MEAN	3.3259	.31589	Agree

Source: survey data, 2020.

Table 3 shows that the respondents affirmed that farm extension services were available and were being used by the farmers in their coconut farms. They affirmed that: through extension, coconut farmers are advised on correct coconut planting procedures (3.89); coconut extension services are available at no cost to the coconut farmers (3.88); and extension services create awareness among coconut farmers on latest technology in coconut farming (3.33). The grand mean of the responses was 3.3.

4.4 Coconut Crop Performance in the Study Area

Coconut farmers' perceptions on the coconut crop performance in the study area were determined through the application of Likert scale procedure. The findings are presented in table 4.

Table 4: Perception on coconut crop performance in the area (n=384)

S/N	Item	Mean	Std Dev.	Decision
1	Last year's harvests recorded unprecedented improvement on coconut yields across most farms in the area.	3.0110	0.98723	Agree
2	There are commendations from customers and government officials on the current quality of our coconuts.	4.3123	1.96042	Agree
3	There is increased efficiency in coconut production in the LGA.	3.6723	0.98433	Agree
4	Support of government has enabled farmers to record high yields.	2.0965	0.81757	Disagree

5	Farmers in the area have recorded significant profits on their coconut farms	3.4823	0.65434	Agree
	GRAND MEAN	3.2911	1.239	Agree

Source: Survey data, 2020.

The table 3 presents the farmer's perception of the previous year's coconut harvest in the area. According to the responses: there are commendations from customers and government officials on the current quality of our coconuts (4.31); farmers in the area have recorded significant profits on their coconut farms (3.48); and there is increased efficiency in coconut production in the LGA (3.67).

4.5 Test of Hypotheses

Test of Hypothesis one:

H_0: Adoption of new coconut seed varieties is not significantly related to coconut output of farmers.

H_1: Adoption of new coconut seed varieties is significantly related to coconut output of farmers

Table 5: Test of hypothesis one

Correlations

		New coconut seed varieties	Coconut output
New coconut seed varieties	Pearson Correlation	1	.228**
	Sig. (2-tailed)		0.000
	N	384	384
Coconut output	Pearson Correlation	0.228**	1
	Sig. (2-tailed)	0.000	
	N	384	384

**. Correlation is significant at the 0.001 level (2-tailed).

By using the Pearson correlation analysis as obtained above, it was found that the result is significant at 1% level. Thus, there is a positive relationship between the application of new coconut seed varieties and coconut output. This implies volume of coconut output is directly and strongly related to adoption of new coconut seed varieties. On this basis, we therefore reject the null hypothesis and accept the alternative hypothesis which states that there is a significant relationship between adoption of new coconut seed varieties and coconut output of farmers.

Table 6: Test of hypothesis Two

H_0: Use of coconut extension services is not significantly related to coconut output of farmers

H_0: Use of coconut extension services is significantly related to coconut output of farmers

Correlations

		Coconut extension services	Coconut output
Coconut extension services	Pearson Correlation	1	.217**
	Sig. (2-tailed)		0.000
	N	384	384
Coconut output	Pearson Correlation	0.807**	1
	Sig. (2-tailed)	0.000	
	N	384	384

**. Correlation is significant at the 0.001 level (2-tailed).

Using the Pearson correlation analysis as obtained in table 6, it was found that the result is significant at 1% level. Thus, there is a positive relationship between the farm extension services and coconut production. This implies that volume in coconut output is directly related to availability and use of farm extension services. On this basis, we reject the null hypothesis and accept the alternative hypothesis which states that use of farm extension services is significantly related to coconut output of farmers.

DISCUSSION, CONCLUSION &RECOMMENDATIONS

Coconut is a perennial crop and one of the most important crops grown in more than 93 countries in the world in an area of 12.19 million ha, with an annual production of 61.165 million nuts equivalent to 13.59 million tons of copra. More than 11 million farmers, mostly smallholders with low income, grow the palm in 90 countries (FAO, 2009). The coconut industry in Nigeria has huge potential that can contribute significantly to the growth of the nation's Gross Domestic Product (GDP). The leading states in cononut production in Nigeria are Niger, Kano, Jigawa, Zamfara,Kebbi, Sokoto, Katsina, Kaduna, Adamawa, Yobe, Borno, Taraba, Plateau, Nasarawa, Bauchi, Lagos and Ogun states. However, other states like Akwa Ibom are catching up. Indeed, the first coconut refinery in Nigeria has been established in Mkpat Enin LGA by Akwa Ibom state government with complementary coconut plantations sited in several LGAs. This research has provided modest results on the relationships between adoption of new coconut seed varieties and coconut yield, and between use of farm extension services and coconut yield in Mkpat Enin LGA, Akwa Ibom State. Given the background of the respondents in terms of age, education, experience and income profiles it is obvious that the farmers possess both the capacity and capability to be successful in the adoption of technologies in coconut farming.

The results of the analysis showing direct relationships between adoption of new coconut seed varieties and coconut yield, and between use of coconut extension services and coconut yield indicate that prospects for greater coconut production depends on adoption of appropriate coconut production technologies. These outcomes appear to be in line with the findings and assertions of earlier researchers: for example Aragon (2000) found that adoption of technologies led to declining poverty level, as a result of improved coconut yield; farmers were able to manage major coconut pests as a result of adoption of appropriate technology (Ruvani, 2018); and Negash (2007) who found that for low coconut production and productivity in Ethiopia were as majorly caused by poor adoption of improved technologies and marketing.

The implications of the significant and direct relationship between technology and coconut yield could suggest it as an added stimulus that skewed the perceptions of farmers in favour of technology adoption as predicted in the TAM.

In the light of the above, our submissions are that: government at both local and state levels should assist the farmers in procurement of not just new coconut seed varieties but also in the procurement of other coconut farm inputs such as organic manures and fertilizers which literature has shown are also critical determinants of coconut output. It is also being suggested that government should continue to extend and improve on coconut extension services to coconut farmers. This is aimed at advising the farmers on available and new coconut planting technologies, to improve their yield.

We also do acknowledge the efforts of Akwa Ibom State government in the promotion of coconut farming in the state especially with respect to establishment of coconut plantations in many local government area, but it is our fervent hope that they should also show similar interest in the affairs of small holder coconut farmers who, it appears to, have been left out in the scheme of things.

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