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COST- BENEFIT ANALYSIS OF SMALL SCALE BROILER FARMERS IN NORTHERN AGRICULTURAL ZONE OF NASARAWA STATE, NIGERIA

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ABSTRACT

One of the key economic activities that will help in creating job opportunities is the mobilization of citizens towards participation in micro enterprises, of which broiler production is considered as one. In this study, the profitability of small scale broiler production in northern agricultural zone of Nasarawa state, Nigeria was determined. Sixty poultry broiler producers were randomly selected for the study. The total variable cost was ₦161,553.29 and total fixed cost was ₦8,298.24, giving a total cost of ₦169,851.53. The total revenue of ₦247,354.80, gross margin of ₦77,503.35, net farm income (NFI) of ₦0.4074, and gross ratio of ₦0.6867were obtained. Variable cost constituted 95.13% of the total cost of production. The percentage profit was calculated at 45.63% while the NFI was computed at ₦0.41. Some of the ways to improve broiler production are; adequate management practices, availability of credit institution, use of less expensive feed ingredients and adequate vaccination, proper use of broiler production technology. It is recommended that policies aimed at improving the scale of production of broilers should be established by the government.

Keywords**:** Benefits-cost analysis, small-scale broiler farmers, agricultural zone, Nasarawa State

INTRODUCTION

The most important thing that can happen to any country is sustainability in its agricultural productivity through effective resource utilization and cost minimization. It is always right to say that agriculture is the main stay of many developing countries especially in its numerous benefits some of which include employment generation through various value chain addition, wealth creation, raw material development and supply, source of occupation, among others. According to (Paddy, 2011), the happiness of a nation is like a tree, farming is its roots, and commerce and industry are its branches and leaves. If the root is removed, the branches will die and the leaves fall off. That is how important agriculture is to any nation. The fundamental value of agriculture in the development and growth of the Nigerian economy is indicated in its contribution to food security, industrialization and the linkage effects with employment, income, market opportunities for industrial output and reduction in poverty. However, the sector is yet to attract the right kind of attention and quantum of investments that will enable it to realize its full economic potentials and development capacities. Agricultural growth and development are

important to increase food supplies and improve the nutritional status of the people. This is particularly true where food production per person actually fell over the past years. The provision of food and fibre for the growing national population is another key role for agriculture. It is estimated that for the whole world and for the developing countries of Africa, Asia, and Latin America, the growth of agricultural production over the last decade has exceeded that of the population, so that agricultural production per head has increased. In Nigeria, agriculture provides a means of livelihood for over 70% of the population, raw materials for agro-allied industries and is a potent source of the much-needed foreign exchange (Chukwuji*et al.,* 2016).

Broiler production is one of the major subsectors in Nigerian agricultural industry. Broiler apart from supplying protein is also a good source of lipids and vitamins of high value to man (Bamiro, *et al.*, 2016). Animal protein is essential in human nutrition because of its biological significance. In realization of the importance of animal protein, the various governments of Nigeria have been pursuing programs at national, state and community levels to boost the mass production of livestock products, to ensure the attainment of Food and Agriculture Organization (FAO) recommendation of 3.5g per caput of animal protein per day (Ojo, 2013).Broiler production is unique in that it offers the highest turnover rate and the quickest returns to investment outlay in the livestock enterprises (Sanni and Ogundipe, 2015). Funds invested in broiler production are recovered faster than in any other livestock enterprise. The rate of growth in production of broiler is the highest when compared with ruminants and other monogastric animals (Braenkaert*et al.*, 2012) and the cheapest, commonest and the best source of animal protein (Ojo, 2013). Ogundipe and Sanni (2015) affirmed that returns to investment can be improved by turning out batches in a year depending on the length of the production cycle.

However, despite the growing demand for broiler products, broiler farmers face numerous problems. In Nigeria, for example, broiler farmers have suffered setbacks in broiler production due to rising costs of farm inputs. The high costs of inputs have significantly reduced the returns of the broiler farmers businesses (Aihonsu, 2017).The problems facing broiler farmers in Nigeria are not unique to them only. The competition for broiler inputs has drastically affected the profit margins of the broiler farmers and consequently has altered their expansion programmes (Bradnock, 2012).

In recent times, broiler farmers in Nigeria have been suffering setbacks caused by rising cost of feeds and other inputs used in broiler production, significantly reducing net returns from these businesses. For example, cost of maize, a major ingredient in the production of broiler feeds, rose sharply and steadily. This has caused many broiler producing farmers to exit and prospective investors are becoming increasingly reluctant to invest (Aihonsu, 2017).This situation threatens the survival of broiler sub-sector in the broiler industry and calls for concerted efforts to save the industry from total collapse. Failure to do so could lead to a serious reduction in broiler production and protein intake of people resulting in malnutrition and ill health, which, again, will transform into lower productivity and output. There is, therefore, the problem of finding adequate means of increasing net returns to farmers in the broiler production business. The net returns must be sufficient to retain farmers in the business

and attract more participants (Bradnock, 2012). Given the fact that the farmer has little or no control over the demand and cost of the inputs used in broiler production together with the nature of the market which is more or less perfectly competitive, a more plausible approach to increasing net return to farmers is to reduce the cost of production (Aihonsu, 2017).Anzaku and Onuk (2018) reported that farmers and middlemen are indispensably interdependent and marketing margin is the critical determinants of returns to them. The study objectives are to;

i. Estimate the profitability of broiler production in the study area,

ii. Examine the possible ways of improving broiler production in the study area, and

iii. Identify the constraints faced by farmers involved in broiler production in the study area

The contribution of broiler production to the Nigerian economy cannot be over-emphasized. The total livestock output increased from 26% in 1995 to 59% in 2015, while increase in the production of meat accounted for about 26% during the same period (CBN, 2015). However, despite these increases, the profit margin of farmers has reduced due to high cost of production associated with broiler production (Umeh, 2012). Considering broiler production as a commercially viable business, it demands the application of the knowledge of farm management in the area of effective cost utilization. This will in turn enable the broiler farmers make informed decision on the lowest cost of production that would generate similar results in terms of broiler production output. Also, through reviewing of related literature, the study will identify gaps left uncovered or filled by previous researchers and close these gaps. By doing this, the study must have immensely added to the existing knowledge. Similarly, it will make the members of the society get acquainted with more innovative methods of obtaining least cost inputs used in broiler production from the study area. Additionally, it will be of immense importance and serves as source of secondary data for future researchers who may want to carry out similar study on the topic under investigation.

METHODOLOGY

The Study Area

The study was conducted in the North Central Agricultural Zone of Nasarawa State. The zone comprises of four Local Government Areas (LGAs) namely; Akwanga, Kokona, Nasarawa-Eggon and Wamba. The four (4) LGAs have a combined population of 335,453 persons (NPC, 2006). The State lies between latitude $7^0$and 9^0North and longitude $7^0$and 10^0East. The state shares common boundary with Plateau State and Taraba State in the East, Benue State in the North, Kaduna State in the North, Kogi State and FCT in the West. The State covers a land area of about 27,137.8 square kilometer with a population of 1,863,275 million people and also the projected population of 1,915, 544.67 million people using a growth rate of 2.8% for year 2015 (NPC, 2006). The State has a distinct dry and wet season climate with maximum mean temperature reaching as high as 34^0C. December and January are the coolest months. The mean annual rainfall pattern ranges from 1100 to 2000 mm in the Southern part. Generally, mean annual rainfall is less than 1000mm. The major vegetation formations in the State are Southern guinea savanna, Northern guinea savanna and the Sudan savanna. Nasarawa State is endowed with significant hectares of arable land

suitable for the production of various agricultural crops. The climate favors the production of both permanent and arable crops (NPC 2006).

Sampling Technique and Sample Size

A multi-stage sampling technique was adopted and used for the selection of broiler farmers in the study area. The first stage involved the selection of 3 LGAs (Akwanga, Kokona and Nasarawa-Eggon) from the existing 4 LGAs. The second stage involved the random selection of five (5) villages each from the selected LGAs where broiler productions undertaken, making a total of fifteen (15) Villages. The final stage involves the random selection of four (4) broiler farmers from each of the selected villages, making a total of sixty (60) broiler farmers that were used for the study.

Data Collection and Analysis

The data for this study was collected from primary source which was obtained using the interview method with structured questionnaire that was administered among the broiler farmers. Descriptive statistics such as the mean, frequency distribution, and percentages, were used to achieve objectives ii, and iii, while budgetary technique was used to compute objective i.

Budgetary Analysis

The farm budgetary technique (costs and returns) was employed to analyze objective i of the study. This was used by Olukosi and Erhabor (2008). They stated that the gross margin is the difference between gross farm income and the total variable cost incurred in the production process. The farm budgetary technique was used to determine the profitability level of broiler production in the area. The model is specified as:

GM = G1 – TVC ---------- (1)

NFI=GM–TFC..... (2)

Where,

GM = Gross margin per 100birds (₦)

GI = Gross income per 100 birds (₦)

TVC = Total variable costs per 100birds (₦)

NFI = Net farm income per 100 birds (₦)

TFC = Total fixed costs per 100birds (₦)

Results and Discussion

Cost and Return Analysis of Broiler Production in the Study Area

Table 1presents the structure of cost and return in broiler production among farmers in the study area. Findings from the study showed that the variable cost items constitute 95.13% of the total cost. Therefore, they are very crucial to the success of broiler production in the study area. This can be made better if proper and adequate measures are taken to utilize feed efficiently by the introduction of highly improved broiler breeds which has high feed conversion efficiency. Increase in the level of scale of operation is also advised so that distribution of high cost inputs will be distributed among larger number of birds which will in turn cut down the cost of production.

Furthermore, the results in Table 1 also show that the computed total variable cost (TVC) was ₦161,553.29, while the total fixed cost (TFC) was estimated at ₦8,298.24. Similarly the total cost (TC) which comprised of variable and fixed cost accounted for ₦169,851.53 with total revenue (TR) generated of ₦247,354.80. The determined gross margin (GM) and net farm income (NFI) were ₦77,503.35 and ₦0.4074, respectively. The computed gross ratio (GR) was ₦0.6867 with a percentage profit of 45.63%. This indicates that broiler

production is a viable venture and should be given priority in terms of livestock production not only for its economic benefits but as a source of animal protein and in meeting social needs of society at all levels.

Ways of Improving Broiler Production

The various ways of improving broiler production in the study area are presented in Table 2. Majority (90%) of the respondents suggested that credit institution should be made available, 86.7% also suggested that the means of adequate management practices should be made less expensive, 75.0% and 61.0% suggested that a favorable government policies on price of feed and vaccine for broiler production should be enacted, prices of purchased chicks should be reduced, and the activities of middlemen should be regulated.

Constraints Faced by Farmers Involved in Broiler Production in the Study Area.

Table 3 shows the results of constraints faced by farmers involved in broiler production in the study area; High cost of production ranked first and accounted for 70%, low quality of broiler chicks ranked second and accounted for 60.0%. About 46.7% of the sampled farmers reported environmental challenges and ranked third, while 45.0% reported poor feeds quality and ranked fourth. Also, 41.7% of the farmers reported improper use of technology as their major problems and this ranked fifth, while problem of shortage of labour ranked sixth and attracted 35.0%. Similarly, low prices of broiler meat, management challenges, poor technical extension services, and poor water quality accounted for 33.3%, 31.7%, 21.7% and 20% ranked seventh, eighth, ninth and tenth, respectively. Others include 11.7% and 8.3% which ranked 11^{th} and $12^{th,}$ respectively reported delay in feed delivery and low quality feed as their problems.

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CONCLUSION

Based on the findings of the study, the estimated parameters indicated that broiler production is a lucrative venture and should be given priority in terms of livestock production. This can be made better if proper and adequate measures are taken to utilize feed efficiently by the introduction of highly improved broiler breeds. Increase in the scale of operation should be improved so that high cost inputs will be distributed among larger number of birds which will in turn cut down the cost of production. It is further recommended that small scale broiler farmers should increase the use of underutilized inputs for optimum output, source for fund in financial institutions to better their chances to raise capital for broiler production, relevant agricultural agencies should organize seminars/workshops to improve the literacy of the farmers on improved technologies with respect to broiler production. Also, government should formulate policies aimed at improving the scale of production of the broiler farmers and finally government in collaboration with other research institutions should make provision of improved breeds of broilers to enhance broiler production.

Table1: Cost and return analysis for an average of 100 broiler chickens in the Study Area

Item	Mean amount in naira per bird	% in cost class	% of total cost
Total Revenue for 100 birds (TR)	247,354.80		
Variable Cost (VC)			
Labour	24,420.00	15.12	14.38
Water	1,083.33	0.67	0.64
Electricity	1,719.36	1.06	1.01
Fuel	2,421.67	1.50	1.43
Feed	94,550.87	58.53	55.67
Vaccine	1,729.03	1.07	1.02
Chicks	35,629.03	22.05	20.98
Total Variable Cost (TVC)	**161,553.29**	**100**	
Gross margin (GM) (TR-TVC)	**77,503.35**		
Fixed cost (TFC)			
Depreciation on Fixed Inputs	8,298.24		4.97
Total Fixed Cost (TFC)	**8,298.24**		**100**
Total Cost	**169,851.53**		
Mean net revenue	69,205.11		
NFI = TR-TC	69,205.11		
NFI/N invested	0.4074		
Income expenditure ratio	1.4563		
(TR\TC)			
GR= (TC\TR)	0.6867		
Percentage profit (NR\TC)	45.63%		

Source: Field survey, 2019

Table 2: Ways for improving broiler production

Measures	Frequency	Percentage	Rank
Effective management practices	54	90.0	1st
Availability of credit institution	52 `	86.7	2nd
Use of less expensive feed ingredients	45	75.0	3rd
Adequate vaccination	37	61.7	4th
Proper use of broiler production technology	36	60.0	5th

Source: Field survey, 2019Multiple responses

Table3: Constraints faced by farmers involved in broiler production in the study area

Constrains	Frequency	Percentage	Rank
High production cost	42	70.0	1st
Low quality chicks	36	60.0	2nd
Environmental challenges	28	46.7	3rd
Poor feed conversion ratio	27	45.0	4th
Improper use of technology	25	41.7	5th
Shortage of labour	21	35.0	6th
Low price of broiler meat	20	33.3	7th
Management problems	19	31.7	8th
Lack of technical service	13	21.7	9th
Low drinking water quality	12	20.0	10th
Delay in feed delivery	7	11.7	11th
Low quality feed	5	8.3	12th

Source: Field survey, 2019Multiple responses

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RURAL YOUTHS PARTICIPATION IN CASSAVA PRODUCTION: A CASE OF NASARAWA LOCAL GOVERNMENT AREA OF NASARAWA STATE, NIGERIA

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ABSTRACT

Youth generally form a formidable force to be reckoned with for a sustainable development. This study examined rural youth participation in cassava production in Nasarawa State, Nigeria. Primary data were collected from young cassava farmers using questionnaires and interview schedule. Descriptive statistics such as frequency, percentage, mean, and ranking order score, as well as participation Index using 5-points likert scale were employed to achieve the objectives of this study. Results revealed that the mean age of the respondents was 26 years, most (83.3%) of them were male, and un-married constituted 63.3% and 90% had one form of education or the other. About 68.3% were farmers, while 93.7% were not members of farmers group and had no access to credit. Almost all the respondents (98.3%) had no contact with extension agents. Mean farming experience was 9 years, mean household size was 5 persons, mean farm size was estimated at about 1.6 hactares, and mean annual income was computed at ₦292, 833.33. Results also indicated that youth's participation in cassava production activities was high and some of the benefits derived include; food security, increased level of income, reduced rural urban migration, and major source of employment. Major constraints identified were; damage by livestock, shortage of planting material, poor marketing system and pricing, inadequate capital and credit, and inadequate farm input. It is recommended that government and relevant stakeholders should establish grazing land and creation of water points for livestock to solve the problem of damage by livestock. Farmers should be mobilized to form co-operative societies and belong to relevant groups that will facilitate the provision of credits and other inputs at affordable prices as well as assist in conflict resolutions and management.

Keywords: Cassava, participation, production, rural youths

INTRODUCTION

Cassava (*Manihotesculentus*) is one of the world`s most important food crops. In Nigeria, as in most developing countries, it is one of the major carbohydrate sources. Cassava is an important source of dietary carbohydrate, and provides food for over 60 million people in Nigeria (Abdullah, 2003). According to Nwekee*t al*. (2002), eighty percent of Nigerians in the rural area eat a cassava meal at least once a day; hence it plays a prime role in the country`s food security. Apart from its use as a staple food to human beings other uses include animal feed formulation, agro-industrial uses (e.g. starch, ethanol, adhesive, and fructose/glucose syrup) and the peels used in

organo-mineral fertilizers formulation (Iyagba, 2010). Cassava is important not only as a food crop but even more as a major source of income for rural households. The crop ranks very high among crops that convert the greatest amount of solar energy into soluble carbohydrates per unit area and it gives a carbohydrate production which is about 40% higher than rice and 25% more than maize, with the result that cassava is the cheapest source of calories for both human nutrition and animal feeding (Tonukari, 2004). A recent study on cassava shows that it accounts for about 70% of the total calories intake of more than half of the population (Nneoyi, *et al*., 2008).The trend for cassava production in Nigeria is rapidly increasing and expansion of the multi-purpose plant has been relatively steady. Nigeria is making use of its cassava crop to diversify and boost its economy by making cassava a sustainable economic edge over its contemporaries.

Cassava production and products are becoming more popular in Nigeria as food and in almost all agricultural markets. This has provided strong opportunity for more agents to be engaged in the cassava value chain. As reported by FAO (2018), cassava is considered as a crop that will help in rural development, poverty reduction, economic growth and ultimately self-sufficiency in food security for Nigeria. It is in recognition of the above that relevant stakeholders have seen the need to continue advocating for the development of the cassava sub-sector in Nigeria, Eke-Okoro and Njoku (2012). The increasing importance and acceptability of cassava among the crops grown in Nigeria is not only related to its increasing demand as food but, also as food security (FAO, 2018). According to Ikuemunesana*et al.* (2020) who reported that large proportion of cassava crops are grown on marginal lands with bad topography that are usually not competitive and not too good for the cultivation of other crops with some other lands that are not machine friendly.

Youth is a state or time of being young, a transition between childhood and adulthood. It is characterized by energy, intelligence and hope-attributes that enable youths to improve their knowledge and capabilities for development, and which partly compensate for the seeming handicaps of limited access to economic assets such as land (Eremie, 2002). Globally, youth population aged 15 to 24 is more than 1 billion and by approximation 85% live in developing countries (WPAY, 2012). In Nigeria, according to the (NPC, 2006), youth constitute about 35.5% of the population.

FAO (2018) reported that as at 2018, cassava production in the world stood at 275 million tonnes, out of which Africa's output was 170 million tonnes and this accounted for about 56 percent of world production (FAOSTAT, 2019).Similarly, Nigeria's share of the output stood at 60 million tonnes (FAOSTAT, 2019). However, despite been the largest producer in the world, over 90 percent of the produce in Nigeria are consumed locally (Denton, 2004).In order generate sustainable employment and to improve the economy of Nigeria, more emphasis be placed on cassava value addition. Similarly, with the current bilateral relationship between Nigeria and external countries like China, trade relations could energize Nigeria's exports of various agricultural commodities for which cassava is one of the products.

Youth in agriculture has been described as a very important structure for land and agrarian reform which go a long way towards promoting the interest of youth in the agricultural sector of the economy (Gwanya, 2008). Since agricultural development is the basic tool for economic development, there is the need for more emphasis to be placed on

the role youth can play in agriculture (Fatunla, 1996). In Nigeria, agricultural production is still carried out using physical strength which decline with age. This has therefore been observed as one of the major constraints in agricultural production in Nigeria (Okowo, *et al*., 1999). Though youths have desirable qualities that can promote agriculture, most of them havestrong apathy toward it (Adewale*et al*., 2005). With fewer youths into agriculture, the long term future of the agricultural sector is in contemplation. The development of the agricultural sector of Nigeria economy therefore depends on young people, more especially the rural youths. This is because a large population of youths represents the link between the present and future as well as a reservoir of labour (Okeowo*etal*., 1999).Study has shown that children and youth contributed significantly in agricultural activities, such as in cassava production (Ugwoke*etal*., 2005).In view of this, the study seeks to; describe the socio-economic characteristics of the rural youth participation in cassava production, ascertain the respondents' level of participation in cassava production, ascertain the socio-economic benefits derived from cassava production, and identify constraints to youth participation in cassava production in the study area.

METHODOLOGY

Description of the Study Area

The study was conducted in Nasarawa Local Government Area (LGA) of Nasarawa State. It has an area of 5,704km^2 and a population of 189,835 (NPC, 2006). The LGA is on the latitude 8^{o}32$^{'}$20$^{"}$N and longitude 7^{o}42'29"E. Itis located at the intersection of local roads that lead to Keffi and the Benue River ports of Loko and Umaisha. The LGA shares common border with Toto in the West, Abuja FCT in the North-West, Karu and Kokona in the North, Lafia in the Northeast, Doma in the East and bounded by Benue and Kogi State by the Benue river in the South. The area falls within the guinea savannah where there is moderate rainfall with clear and bright days in the raining season, which begins in April/May and ends in September/October every year. The major ethnic groups in the study area include; Afo, Igbira, Agatu, Gade, Gwari, Bassa, Hausa and Fulani. The people are predominantly farmers and crop enterprises include maize, sorghum, yam, cassava, melon, beniseed, rice, millet, groundnut and vegetables. Livestock enterprises by the people include cattle, goat, sheep, poultry and fish farming.

Sampling Techniques and Sample Size

The target populations for this study were youths. A two-stage sampling technique was used for the study. First, six (6) villages were purposively selected out of the ten (10) villages noted for the production of cassava within Nasarawa Local Government Area (LGA). In the second stage, ten (10) households were purposively selected from each of the six (6) villages and a youth was sampled out of each of the households, making sixty (60) youths as sample size for the study.

Method of Data Collection and Analysis

Primary data were used in the study. The data were collected from the field with the aid of structured questionnaire. Simple descriptive statistics such as frequency count, mean, percentage and ranking order score were employed to achieve objective i, iii and iv. Objective ii was achieved using a participation Index. The participation Index was constructed using a 5-point likert scale. The respondents were asked to indicate their

level of participation (Very high, High, Moderate, Low and Very low) in ten (10) management practices involved in cassava production. The 5-point likert scale was weighed in order of importance from Very high=5, High=4, Moderate=3, Low=2 and Very low=1. The mean score for each of the practices was calculated and the grand mean scores of all the practices was divided by the number of the practices to determine the level of participation of youths in cassava production in the study area.

RESULTS AND DISCUSSION

Socio-Economic and Demographic Characteristics of Respondents

The result in Table 1 showed age distribution of respondents. It revealed that 78.3 percent of the respondents were between the ages of 21 and 30 years, 15 percent were more than 30 years while 6.7 percent of the respondents were less than 20 years. This implies that majority (78.3 percent) of the respondents' falls within the age range between 21 to 30 years. The mean age of the respondents was computed at about 26 and this indicated that they were in their youthful ages and hence very productive. Also, majority (83.3 percent) of the respondents were male, while 16.7 percent were female. According to Adewale*et al.* (2005), gender is no barrier to active involvement in cassava production activities as they may be involved in various activities along the cassava value chain. However, Oladeji*et al.* (2003), observed that it is generally believed that male are often more energetic and could readily be available for energy demanding jobs like cassava farming. The result of this study is therefore not surprising that majority of the respondents are males with few females possibly in the other less tasking areas along the value chain, such as processing, marketing, etc. This also implies that male participated more in cassava production than female in the study area, and it may be as a result of the fact that women were more involved in off farm activities than men especially processing and utilization of the harvested farm produce.

As shown in Table 1, 63.3 percent of the respondents were single, 35 percent were married while 1.7 percent of the respondents were widowed. Since most of the respondents were single, they could have more time to learn new skills as well as save adequate money for cassava production and other related services without distraction from family members. Also, as reflected in Table 1, 10 percent of the respondents had no formal education, while 16.7 percent, 46.7 percent and 26.6 percent of the respondents had primary, secondary and higher education respectively. This indicated that majority (90 percent) of the respondents were educated. Ojuekaiye (2001), posit that education is an important socio-economic factor that influences farmers decision because of its influence on farmer`s awareness, perception, reception and adoption of innovation that can bring about increase in production. Since a high percentage of the youth were educated, their education is expected to enhance adoption of recommended cassava production practices in the study area. It was also observed that 68.3 percent of the respondents practiced farming as their major occupation, 16.7 percent engaged in teaching, 10 percent engaged in trading, 3.3 percent were health practitioners while 1.7 percent of the respondents engaged in civil service. This implies that farming is the most prevalent activity in the study area. Data collected revealed that 76.7 percent of the respondents farmed on between 1 and 2 hectares, 13.3 percent farmed on less than 1 hectare, while 10 percent of the respondents

cultivated on more than 2 hectares. Going by Ojuekaiye (2001), classification of farm size of 0.1 hectare to 5.9 hectares as small farms, it then implies that all the respondents were small scale farmers. It was also revealed that 66.6 percent of the respondents had between 4 and 6 persons in their families, 21.7 percent had household size ranging from 1 to 3 persons while 11.7 percent had 7 to 9 persons in their families. The fact that the respondents had low household size is understandable because they are youth, since mean household was about 5 persons. Also, it was observed that 43.4 percent of the respondents had between 6 and 10 years of cassava production experience, 28.3 percent of the respondents had Cassava farming experience of 11 to 15 years, 23.3 percent had between 1 and 5years of experience, while 5 percent of the respondents had between 16 and 20 years of experience in cassava production.

This implies that most of the respondents had good experience in cassava production since mean years of experience was about 9 years. Table 1 also showed that 98.3 percent of the respondents had no contact with extension agents while only 1.7 percent of the respondents had such contact. Though they are fairly educated, but access to extension could help in improving their adoption and productivity of cassava production in the study area. Credit is a very strong important factor that is needed to acquire and develop farm enterprises (Ekong, 2003). Its availability and affordability could determine the extent of production capacity. As shown in Table1, majority (96.7 percent) of the respondents had no access to credit, while 3.3 percent of the respondents had. Data collected also revealed that 96.7 percent of the respondents did not belong to any farmers group, while 3.3 percent of the respondents were members. This implies that despite their literacy level, it may either mean that they did not know the importance and benefits of cooperative, which possibly could have improve their participation and knowledge of group benefits and advantage of being a force to be reckoned with in any given economic activity, as well as other community and social engagements. As further shown in Table 1, 41.7 percent of the respondents earned income of between ₦210,000 and ₦400,000 yearly, 40 percent earned below ₦210,000, 11.6 percent of the respondents earned between ₦410,000 and ₦600,000, while 6.7 percent of the respondents earned income ranged from ₦610,000 to ₦800,000 annually. This shows that majority (80 percent) earned between ₦210, 000 to ₦800, 000 as income annually. And this may mean that considering their scale of farming in the local environment, their production may be described as fairly financially stable.

Respondents Level of Participation in Cassava Production Activities

Cassava production involves the performance of several tasks. The result in Table 2 showed that the youth in the study area participated in most farming operations especially planting with the mean value of 4.70. The mean values for land preparation, bush clearing and marketing were 4.67, 4.55, and 4.55, respectively. Others include disease/pest control, weeding, harvesting and processing with the mean value of 4.40, 4.38, and 4.12 each, respectively. Table 2 also revealed the participation of the respondents in fertilizer application with the mean value of 3.30, while they participated low in storage with the mean value of 2.12. With the grand mean value of 4.09 as shown in Table2, rural youth highly participated in cassava production in the study area. The findings tend to agree with the findings of Adesope

(1999) who reported active involvement of the youth in agricultural activities. The youth who are an embodiment of zeal, strength and innovativeness should be encouraged as they perform their role in national building as well as in sustaining the food security of Nigeria in particular and the world at large and more importantly encouraging agricultural development. The implication of this finding is that, what the youths need is the right incentive and environment to improve their level of productivity which will eventually lead to sustainable prosperity.

Socio-Economic Benefits Derived from Cassava Production by Rural Youth

From the result of the data (Table 3), it was revealed that the major benefits derived from cassava production is food security which was ranked 1st with the percentage value of 88.3,followed by increased level of income and reduced rural-urban migration ranking 2nd with the percentage value of 83.3, respectively. Others include paying children school fees ranked 3rd, source of capital ranked 4th, major source of employment ranked 5th while serves as collateral was ranked 6th with the percentage values of 73.3, 71.7, 31.7 and 15.0, respectively. The above findings agree with Nweke*et al.* (2002), who noted that eighty percent of Nigerians in the rural areas eat a cassava meal at least once a day; hence it plays a major role in the country`s food security. This further confirms cassava as one of the staple food crops in Nigeria.

Constraints to Youths' Participation in Cassava Production.

According to Ikuemonisana*et al.* (2020) one of the problems around cassava production is the type of land tenure system in Nigeria and other countries in sub-Saharan Africa which does not allow for large farm sizes suitable for mechanization. The study further revealed that majority of the cassava farmers cultivates small farms which are not economically feasible and viable for mechanization. Similarly in a study by Abass *et al.,* (2014) who argued that without mechanization, improved inputs alone will not yield the desired results of boosting cassava production in Nigeria. However, despites many challenges faced by farmers, cassava is one of the fastest growing staple food crops in cassava consuming countries and it continues to gain acceptability among farmers while industrial demand also rises steadily (FAO, 2018).

Table 4 shows the constraints to rural youth`s participation in cassava production which were ranked in descending order from the highest to the lowest according to the percentage values. Damage by livestock was ranked 1st with percentage value of 83.3 followed by shortage of planting material ranked 2ndand accounted for 80 percentage. Poor marketing system and pricing was ranked 3rd with percentage value of 73.3. Inadequate capital, inadequate credit facilities and inadequate farm input were ranked 4thand attracted 68.3 percent each, respectively. Poor return on investment was ranked 5th, low level of infrastructure ranked 6th, inefficient extension delivery system ranked 7th, and inadequate farm land ranked 8th with percentage values of 66.7, 58.3, 35 and 16.7, respectively. People`s perception of agriculture and inadequate storage facilities were ranked 9th with percentage value of 13.3 each respectively; while limited processing options was ranked 10th with percentage value of 5.

Table 1: Socio-economic characteristics of the respondents.

Variables	Frequency	Percentage	Mean
Age (years)			
≤20	4	6.7	
21-30	47	78.3	25.85
>30	9	15.0	
Total	**60**	**100**	
Gender			
Male	50	83.3	
Female	10	16.7	
Total	**60**	**100**	
Marital status			
Single	28	63.3	
Married	21	35.0	
Widowed	1	1.7	
Total	**60**	**100**	
Educational qualification			
Non-formal	6	10.0	
Primary	10	16.7	
Secondary	28	46.7	
Tertiary	16	26.7	
Total	**60**	**100**	
Major occupation			
Farming	41	68.3	
Trading	6	10	
Teaching	10	16.7	
Health practitioner	2	3.3	
Civil service	1	1.7	
Total	**60**	**100**	
Farm size (ha)			
<1	8	13.3	
1-2	46	76.7	
>2	6	10.0	1.57
Total	**60**	**100**	
Household size			
1-4			
5-8	39	65.0	
Total	21	45.0	4.45
Farming experience (years)	**60**	**100**	
1-5			
6-10	14	23.3	
11-15	20	43.4	
16-20	17	28.3	8.80
Total	3	5.0	
Extension contact	**60**	**100**	
No contact			
1	59	98.3	
Total	1	1.7	
Access to credit	**60**	**100**	
Access			
Non-access	2	3.3	
Total	58	96.7	
Membership of farmers group	**60**	**100**	
Member			
Non-member			
Total	2	3.3	
Annual income	58	96.7	
≤210,000	**60**	**100**	
210,000-400,000			
410,000-600,000	24	40.0	
610,000-800,000	25	41.7	
Total	7	11.6	292,833.33
	4	6.7	
	60	**100**	

Source: Field survey, 2019

Table 2: Distribution of respondents according to level of participation in cassava production

Activities	Level of Participation					Total	Mean
	Very high	High	Moderate	Low	Very low		
Bush clearing	50	3	1	2	4	60	4.55**
Land preparation	53	1	2	1	3	60	4.67**
Planting	53	1	2	3	1	60	4.70**
Weeding	37	13	7	2	1	60	4.38**
Fertilizer application	9	17	22	7	5	60	3.30**
Disease/pest control	36	13	7	4	3	60	4.40**
Harvesting	34	11	7	4	4	60	4.12**
Processing	34	11	7	4	4	60	4.12**
Marketing	48	4	4	1	3	60	4.55**
Storage	4	5	11	14	26	60	2.12*
Grand Total							40.95
Grand mean							4.09**

Source: Field survey, 2019 *=Low**=High

Table 3: Distribution of respondents according to socio-economic benefits derived from cassava production

Benefit	Frequency	Percentage	Rank
Food security	53	88.3	1st
Major source of employment	19	31.7	5th
Source of capital	43	71.7	4th
Increased level of income	50	83.3	2nd
Serves as collateral	9	15.0	6th
Paying children school fees	44	73.3	3rd
Reduced rural urban migration	50	83.3	2nd

Source: Field survey, 2019 Multiple response

Table 4: Constraints to youth participation in cassava production

Constraint	Frequency	Percentage	Rank
Inadequate capital	41	68.3	4th
Inadequate farm land	10	16.7	8th
Shortage of planting material	48	80.0	2nd
Inadequate credit facilities	41	68.3	4th
Damage/threat by livestock	50	83.3	1st
Inadequate farm inputs	41	68.3	4th
Poor return on investment	40	66.7	5th
People`s perception of agriculture	8	13.3	9th
Limited processing options	3	5.0	10th
Inadequate storage facilities	8	13.3	9th
Poor marketing system and pricing	44	73.3	3rd
Low level of infrastructure	35	58.3	6th
Inefficient extension delivery system to farmers	21	35.0	7th

Source: Field survey, 2019Multiple responses

CONCLUSION

From the findings, rural youth in the study area were active participants in cassava production activities. Major benefits include; food security, increase level of income, reduced rural-urban migration, paying children school fees, major source of employment, source of capital, and serves as collateral. Hence, cassava production should be regarded as an integral component in rural income, employment and food supply services in the study area. However, certain constraints were facing the enterprise which includes damage by livestock, shortage of planting material, poor marketing system and pricing.

RECOMMENDATIONS

Based on the findings of the study, it is recommended that; government should establish grazing land and creation of water access for livestock to solve the problem of damage by livestock, Efforts should be made to ensure availability of planting materials accompanying recommended technology package at appropriate time as may be required by farmers and also at affordable prices. Cassava farmers should be able to form farmer cooperatives which will enable them pool their resources together for lending between and among themselves and at a realistic cost to be decided by members. The rural banking scheme as well as micro credit agencies should be encouraged to accommodate the young cassava farmers (youth).

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ASSESSMENT OF THE WELL-BEING OF SMALLHOLDER RICE FARMERS AFFECTED BY RICE SMUGGLING IN OGUN STATE, NIGERIA

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ABSTRACT

This study was carried out to assess the level of well-being of smallholder rice farmers in Ogun State, Nigeria. Respondents were made up of 125 farmers who were randomly sampled within the study area. The area comprises of 20 Local Government Areas (LGAs) of which nine LGAs were purposively selected based on the location of Nigeria-Benin Border where smuggling activities takes place. A structured questionnaire was administered to obtain data for the study. Data were subjected to descriptive statistics. Findings from the study revealed that the well-being of smallholder rice farmers covered specific indicators like financial, health, mental and psychological well-being. On financial well-being, 36.8% of the respondent disagree that their income was stable, while 11.2% agreed with the statement. The study further indicated that the majority (73.6%) of the respondents' level of well-being is low. Government should provide more incentives to rice farmers through subsidizing the cost of fertilizers, rice seedlings, and other rice production inputs in order to encourage more production while increasing farmers' income and raising their level of well-being among recommendations made.

Keywords: Rice smuggling, level of well-being, smallholder rice farmers

INTRODUCTION

Nigeria's successive governments have worked to alleviate poverty and food insecurity. The methods utilized have been influenced by the meanings assigned to food scarcity by various military governments or interventionists. For the past three decades, successive governments have worked tirelessly to reduce the country's high reliance on rice imports by imposing embargoes while also fostering an enabling environment that encourages domestic rice production. In 1980, the Nigerian government launched the Green Revolution as a mechanism to ensure long-term rice production, but it then imported rice from America and India without safeguarding domestic industry. Not until 2015, when the democratically elected government issued a strong policy prohibiting the importation of foreign rice and creating an enabling environment to stimulate domestic rice production by providing subsidized farm inputs such as fertilizer, herbicides, pesticides, and improved varieties of rice seeds to farmers through cooperative groups across the country.

An average Nigerian now consumes 24.8 kg of rice per year, accounting for 9% of total

caloric intake, with annual rice demand estimated at 5.2 million tons (FMARD, 2013). As a result, rice has become a vital commodity in Nigeria's economy. Given the current trend of globalization and an increasingly competitive global market, Nigeria's rice economy is in crisis. Nigeria, which produces about 3.3 million metric tons of rice annually on average and ranks third in Africa behind Egypt and Madagascar, falls short of meeting its domestic demand, which is estimated to be over 5 million tons (Osabuohien and Urhie, 2017). If the money set aside for rice importation were redirected into improving rice production, such as supporting both small and large-scale rice cultivation and milling to meet international standards like its competitors, Nigeria would be able to meet its rice demand and possibly export rice to neighboring countries in a few years (Agro Nigeria, 2019).

Smallholder farmers have suffered a setback in the last three years as a result of some difficulties they face, such as less patronage, low income, and inadequate facilities, due to the activities of rice smugglers, who have struck back with full force with the assistance of some officials from the relevant authorities who have compromised at the expense of smallholder rice farmers, resulting in the farmers' well-being deteriorating (Ibrahim, 2018). People engage in smuggling to make illegal money since the products are obtained at a cheaper price, allowing them to make large profits. If rice smuggling into the country is not stopped, it will devastate Nigeria's rice value chain, which was established by the previous administration, and local farmers may be forced to pursue other livelihoods (NRMAN, 2019). Smuggling can harm people's health by bringing in old, substandard, and unhealthy commodities, it can devastate the economy, and it's essentially a criminal conduct that can lead to armed robbery.

Smuggling has a significant effect on smallholder rice farmers, with high production costs and declining rice prices, smallholder farmers will not be able to make a profit, discouraging them from planting. Due to unfair competition, rice smuggling prohibits domestic traders from entering the rice business (Emmanuel, 2015). Smuggled rice is sold for less than the cost of production because smugglers avoid paying import taxes, lowering costs and giving them a price advantage over farmers who produce rice locally.

According to the World Bank assessment, there is "sufficient evidence" that illegal smuggling over sub-regional boundaries accounts for approximately 6 billion naira, or nearly 25% of the entire current yearly revenue received by the Customs Service (World Bank, 2019). If the government does not take immediate action to combat smuggling into Nigeria, it will further impede the customs service's operational effectiveness and result in greater revenue losses (The Nigerian Voice, 2019). The government of Nigeria is expressing its determination to end the era of food imports, particularly rice smuggling and develop rice value chains to produce and add value to the product and create domestic and export markets for smallholder rice farmers (IFPRI, 2018). Considering the critical effect of smuggling on the well-being of smallholder rice farmers this study therefore deemed pertinent to assess the well-being on smallholder rice farmers in Ogun State, Nigeria, this study therefore intends to;

i. Describe the socio-economic characteristics of rice farmers in Ogun State?

ii. Categorize smallholder rice farmers based on perceived effects of rice smuggling?
iii. Assess the level of well-being of smallholder rice farmers in Ogun State.

MATERIALS AND METHOD

Study Area

The study was carried out in Ogun State which is geographically located in the south west Nigeria. Geographically, it lies on longitude 7˚00'N of the equators and 3˚35'E of the Greenwich meridian. It covers area approximately 16,980.55 square kilometers. The state has population of 3,751,140 (Census 2006). It was created in February 1976 and borders Lagos State to the south, Oyo and Osun states to the north, Ondo to the east and Republic of Benin to the west. The climate is equatorial, notably with dry and wet seasons with relatively high humidity. The dry season lasts from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 31˚C to 32˚C (WDI, 2016), high humidity and high temperatures which makes the weather pleasant at times, but also partly tropical hot and humid, it is warm to hot all year round and invites to bathe at average water temperature of 27˚ (WDI, 2016) Agriculture is one of the major occupations in Ogun State and the climate in the state favors the cultivation of rice and other food crops. The state is made up of 20 Local government areas and Idiroko is a town in Ipokia local government of Ogun State, Nigeria which is situated along the Nigeria –Benin border and has been an official border crossing point since at least the 1960s where most of the Nigerian smuggling activities transpires. Eight LGAs in Ogun state are actively involved in rice production and these LGAs are also known to be route of rice smugglers into the country. These local governments include Abeokuta North, Egbeda North, Ewekoro, Ifo, Ijebu-North, Ikenne, Obafemiowode, and Ogun waterside, where in some of this LGAs, there has been the establishment of rice mill that is possibly expected to make Ogun State a major player in rice sector revolution in Nigeria in the nearest future.

Population, Sampling Procedure and Sample Size

The population for the study comprises of all smallholder rice farmers in the study area. A multi-stage sampling procedure was used to select a representative sample for the study. Ogun State consists of 20 Local Government Areas, nine LGAs were purposively selected based on the location of Nigeria-Benin border where smuggling activities takes place and also known for rice cultivation. Thirty percent (30%) of the LGAs were selected randomly, making a total of 3 LGAs which makes a total of 6 political wards. A total of 125 rice farmers were randomly selected for this study. A structured questionnaire and interview schedule were used as instruments for data collection.

Data Analysis.

The data obtained were analyzed using descriptive statistics of frequency counts, percentages, mean and standard deviation.

RESULTS AND DISCUSSION

Socio Economic Characteristics of the Respondents

The selected socio-economic characteristics of the respondents include age, sex, marital status, religion, educational qualification, family size, primary occupation, secondary occupation, monthly income, farm size, and means of farmland acquisition and years of farming experience.

Age

Table 1 shows that 26.4% of the respondents were between 41 and 50 years and 14.4% were above 50 years. It further shows that the mean age of the respondents was 35 years which implies that the majority of the respondents are in their active years and it is expected that rice production should be high. This corroborates the findings of Bello-Kano (2008) who reported that smallholder rice farmers in Ogun state are in their active years.

Sex

Result on Table 1 shows that the male gender constitutes 75.2% while the female constitutes 23.2%. The dominance of the male among the smallholder rice farmers shows that rice production is a male dominant occupation in Ogun state.

Marital Status

Result on table 1 shows that 48.8% of the respondents were married while 29.6% were single and 12% were divorced.

Education Qualification.

Results on table 1 show that 31.2% had formal education while 18.4% of the respondents had no formal education. Literate populations are easy targets for extension information dissemination. So, since more of the respondents have at least primary education, it will be easy to educate them on modern rice production techniques.

Family Size.

Results on table 1 indicate that 38.4% had family size of 5- 6 persons, 28.8% had between 1and2 persons, while 16.4% of the respondents had between 3 and 4 people. However, the mean family size is 5 which imply that most of the respondents have a small family size, this may likely not make family labor enough for farming operation.

Primary Occupation

Result on table 1 shows that all the respondents take rice production as their primary occupation. This is probably as a result of the lucrativeness of the venture and recent policy initiatives that focus on rice production.

Secondary Occupation

Result on table 1 shows that 36 percent of the respondents are traders, 16.8% are marketers while 15.2% engaged in painting and 12.0% are carpenters distinctively. The need for engaging in these secondary occupations may be as a result of the need to augment income from rice farming which is in tandem with the findings of Ajala (2015) who alluded to the fact that farmers engage in numerous incomes generating activities in order to complement income generated from agriculture.

Estimated Monthly Income

Result from table 1 shows that 21.6% of the respondents' income falls within the range of ₦ 31,000 – 50,000 as their monthly income, 16.8% of the respondents' income were between ₦71,000 to 90,000, while 15.2% of the respondents earned within ₦91,000 – 110,000. This however corroborates the findings of Ajala, (2015) who reported that farmers in Ogun State are above poverty line.

Table 1: Socio-Economic Characteristics of Respondents

Variable	Frequency	%	Mean
Age			
Less than 20	19	15.2	34.5
21-30	34	27.2	
31-40	21	16.8	
41-50	33	26.4	
>50	18	14.4	
Sex			
Male	94	75.2	
Female	29	23.2	
Marital status			
Single	37	29.6	
Married	61	48.8	
Divorced	15	12.0	
Widowed	7	5.6	
Separated	5	4.0	
Educational Qualification			
No Formal education	23	18.4	
Primary education	36	28.8	
Secondary education	39	31.2	
Tertiary education	27	21.6	
Others	.0	.0	
Family size			
1-2	36	28.8	5.0
3-4	21	16.8	
5-6	48	38.4	
7-8	9	7.2	
9-10	11	8.8	
Primary occupation			
Farming	125	100	
Secondary occupation			
Teaching	9	7.2	
Painting	19	15.2	
Carpentry	15	12.0	
Tailoring	9	7.2	
Trading	45	36.0	
Marketing	21	16.8	
Plumbing	7	5.6	

Source: Field survey, (2019)

Categorization of Respondents Based on Perceived Effects of Rice Smuggling.

Results on Table 2 presents the perceived effects of rice smuggling. Highlights of findings shows that majority of the respondents (65.7%) confirmed that rice smuggling into the country has adversely affected the level of patronage of homegrown rice, this implies that rice smuggling may be responsible for low level of patronage of local rice. This validates the submission of Lenis (2009) who opined that government

should create measures to reduce or eradicate rice smuggling into the country as it could affect the sales of homegrown rice.

Categorization of Respondents Based on Level of Well-Being.

Results presented in Table 2 reveals that the well-being of smallholder rice farmers covered their specific indicators like financial, health, mental and psychological well-being. On financial well-being, 36.8% of the respondent disagree that their income was stable, while 11.2% agreed with the statement. Also, majority (69.2%) of the respondents strongly disagreed that they are satisfied with their income level. Furthermore, a lower proportion (20.0%) of the respondents disagreed that they need more income generating activities to improve their income level whereas, 35.2% strongly agreed to the statement. Finally, 40.0% of the respondents strongly agreed that their family cannot cope with their low-income level.

On health well-being of the respondents, only a lower proportion (11.2%) of the respondents strongly agreed that they don't enjoy a healthy life, while higher proportion (43.2%) strongly agreed that their personal health condition is normal and good and 12% strongly agreed that their poor health affects their income level. In another perspective, 37.6% of the respondents strongly agreed that they don't feel secured because of health challenge while 19.2% of the respondents strongly agreed that the state of their health makes them worry about their future.

On psychological well-being, 43.2% of the respondents strongly believed that in most ways, their life is close to their idea, while 26.4% strongly agreed that the conditions of their life are excellent. In another perspective, 32.0% strongly agreed that they feel too skeptical about almost everything, while 37.6% strongly agreed that they have a distrustful attitude towards people around them.

On mental well-being, 30.4% of the respondents strongly opined that they don't feel depressed or sad. Furthermore, 27.2% strongly agreed that their life is original and comes up with new ideas while 31.2% of the respondents strongly agreed that their life is ingenious and a deep thinker. Furthermore, 16.8% agreed that they see themselves as someone who tend to be disorganized, finally on mental well-being of the respondents, 36.8% strongly opined that they get nervous about almost everything. These findings are significant for economic and health care planning and other welfare state policies.

Result in table 2 shows that the majority (73.6%) of the respondents' level of well-being is low. The result of this low level of well-being corroborates the findings of Hasan (2011) who asserted that since smuggling reduces farmer's income, other aspects of his well-being such as financial income, health, psychological and mental wellbeing are directly affected which requires proper handling to reduce the tension and psycho social courses in affected community.

Categorization of Level of Well-Being of Smallholder Rice Farmers

Result in table 4 shows that the majority (73.6%) of the respondents' level of well-being was low, to a low proportion (26.4%) with high well-being status. The result of this low level of well-being corroborates the findings of Hasan (2011) who asserted that since smuggling reduces farmer's income, other aspects of his well-being such as financial income, health, psychological and mental wellbeing are directly affected.

Table 2: Categorization of Respondents Based on Perceived Effects of Rice Smuggling.

Perceived effects of rice smuggling	Frequency	Percentage	Mean	S. Dev
High adverse effects	71	65.7	13.56	2.14
Low adverse effects	29	34.3		

Source: Field survey (2019)

Table 3: Level of Well-Being of Smallholder Rice Farmers.

Statement	**SA (%)**	**A (%)**	**U (%)**	**SD (%)**	**D (%)**
Financial Well-being					
My income is stable	11.2	16.8	15.2	36.8	20
I am satisfied with my income as a rice farmer	12.1	12.4	.0	69.2	6.17
My income can meet my basic needs and even more	18.4	27.2	14.4	21.6	18.4
always meet the financial need of my family	24.8	19.2	8.0	31.2	16.8
I need to have secondary source of income to Supplement my present meager income	43.2	34.4	3.2	8.0	12.0
My family cannot cope with my low income level	40.8	26.4	8.8	11.2	12.8
I need more income generating activities to improve my income level	35.2	21.6	.0	23.2	20
Health					
I don't enjoy a healthy life	11.2	15.2	.0	37.6	36.0
My personal health condition is normal and good	43.2	34.4	3.2	8.0	12.0
My poor health is affecting my income level	12.0	8.0	0.0	44.8	34.4
My health is affecting my social life	18.4	37.6	8.8	24.8	10.4
I don't feel myself secured because of health challenge	15.2	18.4	13.6	28.0	24.8
I have not lived a fulfilled life due to my health	21.6	15.2	11.2	35.2	16.8
My state of health makes me worry about the future	19.2	23.2	1.6	25.6	30.4
Psychological Well-being					
In most ways, my life is close to my idea	43.2	34.4	3.2	8.0	12.0
The conditions of my life are excellent	26.4	21.6	.0	31.2	20.8
I am satisfied with my life	19.2	14.4	16.8	21.6	28.0
So far, I have gotten the important things I want in life	23.2	14.4	10.4	24.8	19.2

Source: Field survey (2019)

Table 4: Categorization of Level of Well-Being of Smallholder Rice Farmers

Level of well-being	**Frequency**	**Percentage**	**Mean**
High	33	26.4	
Low	92	73.6	14.59

Source: Field survey, 2019

CONCLUSION

According to the findings the majority of smallholder rice farmers are men, and most of the respondents are in their active years. This study revealed that the well-being of smallholder rice farmers was low. It was discovered that smallholder rice farmers' well-being included particular variables such as financial, health, mental, and psychological well-being. Finally, it was established that rice smuggling is to be blamed for the low level of local rice patronage. Rice smuggling into the country will damage Nigeria's rice value chain development if it continues unchecked.

RECOMMENDATIONS

Based on the empirical findings, discussions and conclusions drawn from this study, the following recommendations were made towards reducing rice smuggling and also to improve level of well-being of smallholder rice farmers.

i. In view of the ratio of male to female farmers as earlier affirmed in the study, it is recommended that platform for sensitization of female gender about rice farming should be created to enhance women's participation in rice production.
ii. The economic recovery growth plan of the current administration that has employment generation, total closure of land borders in its heart should be given more attention in order to improve smallholder farmer's level of well-being.
iii. Finally, the current Government should provide more incentives to rice farmers through subsidizing the cost of fertilizers, rice seedlings, and other rice production inputs in order to encourage more production while increasing farmers' income and raising their level of well-being.

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DECIDING THE ICTS NECESSARY FOR DIFFERENT FORMS OF E-AGRICULTURAL EXTENSION DELIVERY

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ABSTRACT

The paper reviewed important ICTs that can be integrated into digital extension in order to achieve the overall goal of reaching the largest possible clientele base with the best advisory service with the capacity of changing Nigeria's agricultural and food productivity narrative. A number of digital tools, platforms and technologies were identified and it was analysed that a combination of these new digital technologies with traditional forms of agricultural extension delivery methods was the best combination that could ensure maximum technology dissemination. The institutional and infrastructural requirements that help sustain the proper use of ICTs for E-agricultural extension were also identified; so also, were the constant innovative structures and constraints against the use of ICTs for agricultural extension. Recommendation was made that connectivity should be a first, key infrastructure that the government invests in. Most of the internet connections in Nigeria are through mobile phones, new business value and increase in per capita GDP can be derived from the investment in broadband internet. More so, digital extension can be achieved better with better connectivity.

Keywords: Digital agricultural extension, ICTs, extension delivery, E-agricultural extension.

INTRODUCTION

Nigeria's population is expected to reach 400 million individuals by 2050 (The Economist, 2020). The implication of this is simply that we will not be able to feed ourselves with the current agriculture system in the next three decades. The ever increasing imperative for digitalization of Nigerian agriculture is taking momentum now more than ever in the wake of the pandemic and the possibilities of such global scale incidences that have the capacity of impacting supply chains all over the world. Countries, especially developing countries, are required now more than ever to develop alternative pathways of feeding their population.

The internet broadband penetration in Nigeria is abysmally under 10% for the oceanic optical fibre capacities while the optic fibre broadband capacity is less than 7% of (Agboje *et al*., 2017). Nigeria ranks 75th in Global connection index (GCI) in 2019. Most GCI indicators place Nigeria below the global average. More than that, there is lack of adequate ICT infrastructure (Computers, Internet and broadband) in Nigeria (Gillwald *et al*., 2018). Although United Nation (UN)

ranks Nigeria high in the Online Services Index (OSI) and e-government Development Index (EGDI), it does not feature among the top ten in Africa (UNO, 2016).

The question of digital transformation of the economy precedes that of digital transformation of the agricultural system. Digital agricultural extension delivery is a subset of digital transformation in agriculture. Traditionally, agricultural extension (also known as agricultural advisory services) plays a crucial role in promoting productivity, increasing food security, improving rural livelihoods, and promoting agriculture as a pro-poor economic growth engine (IFPRI, 2020).

Extension services use a multidisciplinary tool that combines educational methodologies, communication, and group techniques to promote new technologies, communicate information, and to share knowledge among farmers and rural dwellers (Sousa *et al*., 2016). Davis and Franzel (2018) emphasised that, agricultural extension and advisory services can be a powerful tool to help smallholders break the cycle of low productivity, vulnerability, and poverty. The extension services stand a better position of providing farmers with knowledge and tools about modern agricultural practices, greater access to finance, and market solutions. Extension and advisory services are essential to rural and subsistence farmers who are the central pillar of agriculture and food supply chains in low-income countries (Francis and Addom, 2014).

Most of the family farmers in developing countries live rural areas and are in most cases divorced from technology and vital agricultural support services needed to carry out farming activities. Extension and advisory services are relevant to smallholder farmers, who remain the bedrock of the agricultural and food supply chains in developing countries (Francis and Addom, 2014). Providing farmers with (i) timely and relevant information; (ii) access to credit; and (iii) better market prices could go a long way in addressing global poverty and improving agricultural productivity. The aspect of timely and relevant information, especially with the role of Information Communication and Technology to connect farmers with the information they need has received much attention in the last decade.

Important ICTs for E-Agricultural Extension

Over the years, ICT has become about the most important driving tool for the management of the factors of agricultural production (land, labour, capital and soil) (Daum, 2020). ICTs facilitate interactions and collaborations between actors in the agricultural extension value chain – farmers, agricultural researchers, extension agents and other stakeholders (Farell, 2003). ICT applications have the potential for the identification and solving some of the most critical problems encountered in agriculture such as long spells of drought, outbreak of pests and diseases, seasonality, spatial distribution of farming, cost of transactions and asymmetry in information (Ahn *et al*., 2019).

The application of ICTs in agriculture is gaining global popularity and transforming the sector's businesses. An instance of the impact of ICTs on the agricultural sector is the digitalization of land administrative activities which led to saving 1.32 million working days of man-hours and about 806 million Rupees in bribes (Daum, 2020). In the recent decade, the agricultural sector has experienced significant new technological revolution which has superseded those of a decade earlier and has the capacity to respond

to farmers' needs faster and with greater accuracy.

Mukesh *et al*. (2010) listed some of the ICTs used in digital agricultural extension delivery to include the more prominent ones such as radio, television, short message services (SMS), computers, camera, WhatsApp, E-mail, you-tube, DVDs, video, CD-ROM; the less prominent such as Web-metrics, contact data bases and systems, Web publishing, distance learning packet digital, packet digital assistants and others. Digital platforms such as e-commerce, agro-advisory apps, big data, computational power, and satellite systems like remote sensing, etc (Wolfert *et al*. 2017).

ICT-based extension advisory methods are relevant in areas such as preproduction, production, post-harvest and marketing, financial services, and gathering and distributing of data. Different tools are suitable for different applications (Saravanan *et al*., 2015). In general TV, radio and video are used for awareness creation and transfer of technology. Mobile phones are mainly utilised for collecting and disseminating advisory and market information, such as prices and location. Web portals provide unique opportunities for information sharing and linking with other stakeholders and e-learning is specifically interesting for educational purpose. Social media integrates all functions; from providing advice and sharing knowledge to creating awareness, linking with other actors, and technology transfer. Community radio, telecentres, videos, virtual communities of practice and social media enable farmers and others to 'gain a voice'

The prospects for digital extension in Nigeria and the rest of Africa is becoming more achievable as time goes on. The decade between 2005 and 2015 has seen Africa become the fastest growing continent as per mobile telephone subscription per 100 inhabitants with an increase of 492.7% over Arab states (303.7%), Asia & Pacific (305.3%), Europe (31.5%) and the Americas (107.5%) (Barber *et al*., 2016). It is possible for ICTs to fill the void in public extension is unable to address given that farms are often resource poor and extension agents are in short supply to reach every smallholder (Bell, 2015). Platforms enabled by mobile technologies have been utilized for agricultural extension by enabling farmers access to hotlines for technical agricultural advice or market information such as market locations and commodity prices (Aker and Mbiti, 2010).

There is a growing body of experience providing lessons on factors required for successful ICT applications in agricultural extension and on how ICT can lead to beneficial behaviour change amongst poor farmers (Bell, 2016). Many extension interventions combine ICT channels such as mobile phone services with traditional communication channels, like radio (USAID, 2010). In Tanzania, for example, a multi-channel 'campaign' approach to agricultural extension, integrating dissemination via interactive radio, SMS, field demonstrations, and other channels, led to higher uptake of promoted technologies than any channel alone (Hampson *et al*., 2018).

Principles and Methods of Extension Information Dissemination through ICTs.

To set the stage for ICT use for agricultural extension there are a few considerations to be made. First of all, no matter how wonderful ICTs are their performance is still dependent on the ability to use them. Technical skills are required to host web portals and E-learning platforms (Barber *et al*., 2016).

ICT OPTIONS IN RELATION TO EXTENSION FUNCTIONS					
Information and Communication Technology, Devices and Tools					
Extension Functions	**Radio**	**Videos and TV**	**Mobile Phones (text, voice)**	**Smart Devices and Apps**	**Computer, Internet tools**
Link farmers to markets	Price reports		Access to price information (call in, subscriptions)	Can bring potential buyers and producers together; access price information	Can bring potential buyers and producers together; price info.
Raise (general) awareness of opportunities	Very good	Visuals are usually very helpful as "seeing is believing"		Good option for intermediaries to seek information	Good option for intermediaries to seek information
Provide technical information; demonstrate, or train	Some potential – but limited information delivered	Visuals are usually very helpful as "seeing is believing"	Some potential if farmers can call or text in and sufficient expertise is available	Additional potential to a simple cell phone as it enables web access and plays videos as well	Good option for intermediaries to seek information
Diagnose problems and recommend solution	Some potential if dealing with general problems		Some potential if farmers can call or text in and sufficient expertise is available	Additional potential to simple cell phone as it enables web access. Special diagnostics 'apps' are already available.	Good comprehensive tools are available
Respond to follow up questions raised by clients	Good if producers can call or text and sufficient expertise is available		Some potential if farmers can call or text in and sufficient expertise is available	*Good option for intermediaries to seek information (if optimized for smart devices).*	*Good option for intermediaries to seek information.*
Provides mass advisories	Excellent option	Excellent option	Is an option if users are registered to receive such messages (SMS)	Is an option if users are registered to receive such messages (SMS, email)	Is an option if users are registered to receive such messages (email)
Facilitate access to credit and inputs			Mobile banking, negotiate directly with input suppliers	Mobile/online banking	Online banking
Assist with business planning				Simple farm management 'apps'; record keeping	Farm management tools; record-keeping
Conduct surveys, M&E, enumerations			Some options exist	Many new tools and options including GPS tracking	

Source: *Adapted from Mark Bell, Judith Payne and Andrea Bohn, 2011*

App development also requires adequate computer and technical skills. It is important to recognize that these actors also fall into the value chain as a 'new' inclusion.

Secondly, the impact of ICTs on the farming ecosystem is always relative to the interest and capacity of the user group. The extension administration is therefore saddled with the responsibility of deciding which ICT is best suitable for a particular type of clientele or interest group. ICTs requiring technical knowledge such as e-learning, web-portals and text-based services are best suited for educated farmers while community radio, video and voice-based advisory services should be applied for illiterate farmers. A better approach would be integrating traditional media and new ICTs in order to expand the reach of extension. It is key to allow farmers determine relevance of advisory services and develop content as well as interact with service providers (Francis and Addom, 2014).

Thirdly, much as the prospects of digital extension are huge, ICTs are merely vehicles and people are after content. People subscribe to services that have the content they require. Therefore, extension services should be contextualized, timely, targeted and specific especially to the biophysical and technical needs of the clientele. ICTs are most likely not enough when applied solely, better results are achieved when ICTs are combined with other extension methods such as farmers field school and demonstrations (method, result). Long-term, greater impacts are achieved when ICTs are institutionalized (Christoplos, 2010). Even with institutionalizing ICTs, innovations within ICTs must be adapted to prevalent constraints such as institutional structures, human and financial capital constraints to ensure scaling up and successful implementation (Christoplos, 2010).

Saravanan *et al.* (2015) highlights some implementation processes for ICT incorporation in agricultural extension. These are however recommendations and should be adapted and modified to suit prevailing circumstances. They are: the first action of the organisation/ministry/agency that is going to use ICT-based extension should be an assessment of the needs of the target community; to adapt, monitor and evaluate ICT enabled services it is important to conduct benchmark surveys before introduction; Benchmark surveys also help to get a good overview of the actual situation. Based on the needs assessment and benchmark surveys, localised and customised content needs to be developed; ICT tools need to be selected and developed, in such a way that they correspond to the desires and needs of the target group; The target audience should be sensitised on the presence of the services and how to access them; The newly developed ICT-based services are introduced and used in extension; To ensure sustainability of the services, it is recommended to search for partnerships with stakeholders present in the target area or seek for integration of the services in the public agricultural extension system; Monitoring and adaptation is important, especially in the beginning of the project. Modifications should be made when the project does not correspond to the needs of the audience; finally, an impact assessment should be realised to determine the degree of success of the project.

CONCLUSION

The digital agriculture space in Nigeria is just emerging. There are investments which when put to the right use can significantly alter the face of digital extension in Nigeria. Different ICTs serve different extension purposes with

different outcomes and results associated to each. The study identifies what each ICT has the capacity of accomplishing in terms of agricultural advisory service dissemination and where it is most critical to apply them.

RECOMMENDATIONS

1. ICTs should be introduced into agricultural extension after proper analyses and contemplations regarding which ICT best suits particular stages of extension education.
2. It is imperative for Nigeria to invest quickly and consistently in ICTs that will improve the impact of agricultural extension given that the public extension is no longer effective and a rising population exposes Nigeria's food insecurity frailties.
3. Nigeria's investment in ICT should be based strictly on the potential to integrate such ICT into the agricultural system in Nigeria and its potential to drastically improve information dissemination for adoption of behaviour and productivity altering innovations.
4. Reinforcement of expertise regarding research and content development targeting specific elements of farmers' activities should be done. Since research professionals are not lacking in Nigeria, the premium should be placed on digital content developers who can transfer information seamlessly to farmers to get the desired effects.
5. Connectivity should be a first, key infrastructure that the government invests in. Most of the internet connections in Nigeria are through mobile phones, new business value and increase in per capita GDP can be derived from the investment in broadband internet. More so, digital extension can be achieved better with better connectivity.

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ACCESS TO INFORMATION ON POST-HARVEST TECHNOLOGY BY AGRO-BASED WOMEN ENTREPRENEURS IN ABIA STATE, NIGERIA

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ABSTRACT

This study assessed the accessibility to Post-Harvest Technology (PHT) information by Agro-based Women Entrepreneurs (AWE) in Abia State, Nigeria with a view to: ascertaining the extent of accessibility to PHT information, find out the PHT information sources and identify the factors that influenced access to PHT information by respondents in the study area. Data were collected from a sample of 264 respondents drawn from a population of 2358 registered Agro-based Women Entrepreneurs (AWE) with the aid of a well-structured questionnaire. The collected data were analysed with relevant descriptive and inferential statistics. The results showed that both the younger aged (20-45 years) and older aged (≥ 46 years) AWE in the state had access to different PHT information with no significant difference ($P \geq 0.05$) in all the mean responses of the two groups of women after hypotheses testing. The results also indicated that the PHT information accessed included information on: preservation of harvested crops, value addition/processing of food, food packaging, storage of agricultural products, quality control and distribution of agricultural commodities. The study recommended that new improved PHT information should be released timely in the local language or dialect to encourage more access to PHT Information and to facilitate proper adaptability and acceptance of the PHT information in Abia State by the Agro-based Women Entrepreneurs.

Keywords: Information Access, Post-harvest Technology, Agro-based Women Entrepreneurs, Abia State

INTRODUCTION

The agricultural economic sector of Abia State in South-Eastern Nigeria has numerous young agro-based women entrepreneurs that require improved post-harvest technologies to enhance their agricultural business ventures. The role of women in post-harvest activities such as marketing and processing of agricultural commodities has been recognized globally (Kaslong *et al.*, 2020). Women's participation in agricultural enterprises in Nigeria cannot be overemphasized (Rahaman, 2008). Agricultural entrepreneurship being the process of increased wealth creation through value addition to agricultural produce for man's immediate and industrial uses has become very vibrant especially for the transitioning economies (Sullivan, 2017). This increased wealth creation is generated by persons or entrepreneurs (men and women) who take risks in terms of time and commitment of making available value for some products or services in order to make profits.

For substantial profits to be made, and improved agricultural productivity recorded, the distribution of information on agricultural technologies is indispensable (Sanusi *et al*., 2010). According to Food and Agriculture Organization of the United Nations (FAO, 2017), about one-third of all food produced in the world is lost or wasted. In vastly food-insecure areas such as Sub-Saharan Africa, about 52% of fruits and vegetables, 44% of roots and tubers, and 20% of grains are lost between harvest and consumption. Given this precarious situation and an expected world population increase from 7.6 to 9.8 billion by 2050, rapid resource depletion and a changing climate, food and post-harvest loss reduction need to be at the centre of strategies for sustainable development (FAO, 2017). As the global community strives to achieve the Sustainable Development Goals (SDGs) of eliminating poverty and hunger by 2030, improved post-harvest technology (PHT) has the potential to eliminate loss of food and nutrition requirements of 48 million people in Sub-Saharan Africa, the region most at risk of food and nutrition insecurity (FAO, 2017).

Prompt access to improved Post-Harvest Technology (PHT) information has the potential of enhancing the productivity of Agro-based Women Entrepreneurs (AWE) in Abia State, Nigeria for sustainable food security and effective business performances. According to Oladele (1999) and Majumder (2016), the efficiency of technologies produced and disseminated rests on effective communication via information sources which is the vital process of information dissemination. Any information system that cannot be accessible to users when needed is largely of no use (Ukpabi *et al*., 2015; Odunlade, 2017). Aguolu and Aguolu (2002) identified that availability of information sources does not imply their accessibility. However, it was also identified that accessibility sometimes can be influenced by factors that included proximity to available information sources, literacy level, and attitude towards finding right information by the information seeker (Nwokocha and Chimah, 2016; Odini, 2014; Familusi and Owoeye, 2014; Oyeyinka *et al.* 2014; Abdulsami *et al. 2014*; and Velandia *et al.*,2009).

The need for a concrete assessment on the accessibility to available information on improved post-harvest technology developed by research centres and other stakeholders by young and old women agro-based entrepreneurs for the effectiveness of their entrepreneurship in Abia State is relevant to agricultural extension officers, information scientists, librarians, policy makers and WAE in the state. This study, therefore, was designed to ascertain the accessibility to postharvest technology information by agro-based women entrepreneurs in Abia State, Nigeria. Specifically, the study aimed at identifying the extent of accessibility to PHT information to younger (20 – 45 years) and older aged (≥ 46 years) agro-based women entrepreneurs in Abia State, find out the PHT information accessed and identify the factors that influenced access to PHT information by younger (20 – 45 years) and older aged (≥ 46 years) agro-based women entrepreneurs in Abia State.

METHODOLOGY.

Study Area Description

The study was conducted in Abia State, Nigeria. The state has a sizeable number of agro-based women entrepreneurs and a national agricultural research institute that is noteworthy in post-harvest technology (PHT) research and documentation. Abia is a state in the south eastern part of Nigeria. Politically, it has three senatorial zones and

seventeen Local Government Areas. Abia State lies between Longitudes 04°45′ and 06°07′ North and Latitude 07°00 and 08°10 East, and in the rainforest zone of Nigeria (Ukeje *et al.,* 2017). Geographically, Abia State, which occupies about 6,320 square kilometres, is bounded to the north and northeast by the states of Anambra, Enugu, and Ebonyi. To the west of Abia State is Imo State, to the east and southeast are Cross River State and Akwa Ibom State, and to the south is Rivers State. The southern part of the state lies within the Niger Delta region of Nigeria. With its low-lying tropical rain forest, the southern portion gets heavy rainfall of about 2,400 millimetres per year and the rainfall is normally intense between the months of April through October. The rest of the State is moderately high plain and wooded savannah (Dale, 2010).

In Abia State, the agricultural workforce (about 70% of the population) engage in small and medium scale farming, retail and petty trading of agricultural commodities (Kanu *et al.,* 2017). The state has three (3) agricultural zones, which are; Umuahia, Aba and Ohafia zones respectively. With its adequate seasonal rainfall, Abia State has arable land that produces staple food crops like yams, cocoyam, maize, sweet potato, rice, plantains, and cassava. Tree crops and vegetables are equally produced in large quantities. Pigs, sheep, goats, and poultry are amongst the livestock in the state (Dale, 2010). Abia State has a good number of women involved in agro-based entreprises who require relevant information to enhance their enterprise. The state has 2,358 registered agro-based women entrepreneurs (Abia State Agricultural Development Programme ADP, 2017).

Research Design

Descriptive research design which this study adopted allowed the collection of data needed for analysis from the sample of this study and the opinion of the sample was representative of the entire target population. The target population was made up of 2358 registered agro-based women entrepreneurs and they were grouped into younger (20-45 years) and older (≥46 years) agro-based women entrepreneurs (WAE) in Abia State.

Sample Size and Sampling Techniques.

The sample size of the study was made up of 264 women agro-based entrepreneurs that included 132 young (aged 20-45 years) WAE and 132 older (aged ≥46 years) WAE drawn from the population of 2358 registered agro-based women entrepreneurs across Abia State using a disproportionate stratified simple random sampling technique due to unequal number of local government areas in the zone. The three senatorial zones of Abia State were studied. They comprised Abia South having six local government areas, Abia Central having six local government areas, and Abia North having five local government areas Senatorial Zones and disproportionate stratified simple random sampling technique was used to select two Local Government Areas each from the three senatorial zones in the first stage of selection. In the second stage of sampling, purposive sampling technique was used in the selection of two electoral wards each from the six selected Local Government Areas due to the heavy presence of agro-based entrepreneurships in these localities. Finally, disproportionate stratified simple random sampling technique was used to stratify the number of the younger and older WAE in each of the selected wards due to unequal number of agro-based women entrepreneurs who were registered with the Abia State ADP in the selected wards. Thus, from each electoral ward (stratum), 11 registered younger (aged 20-45 years) WAE and 11

registered older (aged ≥46 years) WAE were randomly selected respectively to form a total of 264 WAE for this study.

Instrument for Data Collection

The instrument for data collection for this study was a structured questionnaire. The instrument was titled Post-harvest Technology Information Questionnaire (PHTIQ) and it was designed in four clusters. It had a four-point rating of Very High Extent (VHE), High Extent (HE), Low Extent (LE), Very Low Extent (VLE) for clusters 1 and 2, while Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree(SD) for clusters 3 and 4 as applicable to the response of the research questions.

Data Collection and Statistical Analysis

The collected data were analysed using descriptive statistics such as mean and standard deviation to address the four research questions while the corresponding hypotheses were tested using t- statistics. The four-point ratings Very High Extent (4), High Extent (3), Low Extent (2), Very Low Extent (1), and while Strongly Agree (4), Agree (3), Disagree (2), Strongly Disagree(1) were used to measure the responses from the respondents with the values of 4,3,2,1 accordingly. Hence, the Mean Point was (4+3+2+1) ÷ 4 = 2.5 and the decision rule was 2.5 +0.05= 2.55. The use of the four point ratings as supported by Agbarevo and Mazza (2018) and Mazza (2019) was to include the four extreme options because a specific user opinion is essential in this study. This therefore makes the four point ratings most ideal for this study. This implies that the mean responses of ≥ 2.55 were regarded as "high responses" and "agreed" while 2.50 to 2.54 were regarded as "moderate but agreed" and below 2.50 were regarded as "low responses or disagreed"

RESULTS AND DISCUSSION

Access to PHT Information by Respondents

Results on access to PHT Information by respondents in the study area are presented in Table 1. The extent of access to PHT information by the younger (20-45 years) women agro-based entrepreneurs WAE with the pooled mean of 2.75 and the older (≥ 46 years) women agro-based entrepreneurs WAE with a pooled mean of 2.63 indicate that there is a high access to PHT information by the younger (20-45 years) and older (≥ 46 years) WAE in Abia State. This implies that PHT information on post-harvest loss prevention of agricultural produce, preservation of harvested crops, value addition / processing of food, processing / value addition to non-food agricultural produce, food packaging, handling of agricultural produce, storage of agricultural products, quality standards, agricultural produce, consumer choice, distribution of agricultural commodities were accessed to a high extent by younger (20-45 years) and older (≥ 46 years) WAE in Abia State. However, the mean results of the younger (20-45 years) and older (≥ 46 years) WAE on the extent of access to PHT information on conservation of agricultural commodities (1.73 & 2.14) for item 3, marketing regulations of agricultural commodities (2.37 &2.12) for item 13, PHT training (2.39 & 2.34) for item 14, PHT empowerment programmes (2.23 & 2.37) for item 15, PHT credit facilities and capacity building (2.30 & 2.29) for item 16 and PHT exhibitions (2.29 & 2.16) for item 17 showed less extent of access. Meanwhile, younger and older WAE agreed that item 4 (quality control of food), scoring a weighted mean of 2.53 and 2.51 respectively is a PHT information needed by WAE for effective agro-based entrepreneurship to a moderate extent.

Therefore, from the responses of the respondents, the findings revealed that there is high extent of accessibility to PHT information by WAE for effective agro-based entrepreneurship in Abia State as indicated by their pooled means of 2.75 and 2.63 for younger and older WAE respectively. These results support the findings of Sullivan (2017) who had emphasized that access to relevant information or communication with stakeholders is one of the characteristics of successful agro-based entrepreneurship. Velandia *et al* (2009) also indicated that access to communication sources and the number of information sources have significant association with innovation and adoption of improved technologies in multifunctional agriculture. The result of the t-calculated (1.52) in the t-test analysis of the two groups of the respondents in Table 2 showed that there is no significant difference ($p \geq 0.05$) between the mean responses of younger and older WAE on the extent of accessibility to PHT information for effective agro-based entrepreneurship in Abia State.

Results on Table 3 revealed that younger (20-45 years) and older (≥ 46 years) WAE in Abia State get PHT information to high extent through radio programmes (2.94 & 2.74), television channels (3.05 & 2.99), extension agents (2.65 & 2.75), information officers and public relation officer (2.77 & 2.62), family members, friends and colleagues (2.94 & 2.85), cooperative group meetings (2.73 & 2.75). The result on item 9 which revealed that family members, friends and colleagues are sources of PHT information for both younger (20-45 years) and older (≥ 46 years) WAE in Abia State agrees with the finding of Amaechi and Oyemike (2015) on information sources among literate women. However, newspaper/magazine (2.18 & 2.26), posters, banners and leaflets (2.36 & 2.43), helpline centres (2.39 & 2.37), phones and computers (2.33 & 2.37), community libraries (2.18 & 2.26), books (2.36 & 2.43), journal (2.39 & 2.37), proceedings (2.33 & 2.37), annual reports (2.16 & 2.32) and dissertation (2.34 &2.21) were amongst PHT information sources that were lowly rated by the respondents. These results seem to agree with Amaechi and Oyemike (2015) findings in Imo State, Nigeria, that sources of agricultural information accessed by women include word-of-mouth, friends and radio. The results also tend to agree with that of Odini (2014) that many African women farmers do not access formal information centres and systems such as libraries due to the scarcity of such information centres in their localities. Generally, from the responses of the respondents, the younger and older WAE in the study are of the same view on the sources of PHT information accessed by WAE for effective agro-based entrepreneurship in Abia State as indicated by their respective pooled means of 2.51 and 2.51. The result of the t – test of the two groups of women respondents in Table 4 showed no significant difference ($p \geq 0.05$) in their responses. This is to say that the no significant difference in the mean responses of the two groups is an indication that both groups access same PHT information sources.

Factors that influence PHT information Access to Respondents

The results on Table 5 showed that younger (20-45years) and older (≥46 years) WAE strongly agreed that the factors that influenced their accessibility to PHT information for effective agro-based entrepreneurship in Abia State are availability of radio set (3.02 & 2.97), ownership of mobile phone (2.63 & 2.61),

knowledge of time to tune in for relevant radio and television programmes (2.54 & 2.57), availability of steady electricity supply to power electronic gadgets (2.58 & 2.55), ability to read information in prints (2.73 & 2.63), willingness of extension agents to teach about PHT in a local language/dialect (3.11 & 3.14), family members, friends and colleague always available to give any information (2.85 & 2.75), information from village and cooperative meetings (2.77 & 2.72) and scarcity of PHT information in a location (2.84 & 2.77) as indicated by their respective 2.79 and 2.75 pooled means. This result agrees with earlier findings of Familusi and Owoeye (2014), Oyeyinka *et al.* (2014) and Abdulsami *et al.* (2014) on factors that influence access to information by rural agricultural audience and market women in Ekiti State, Oyo State, and Kaduna State of Nigeria respectively. The result of the corresponding hypothesis in Table 6 indicated that, there is no significant difference ($p \geq 0.05$) between the mean responses of younger and older WAE on the factors that influence the accessibility to PHT information for effective agro-based entrepreneurship in Abia State. On the issue of scarcity of PHT information in a location, Nwokocha and Chimah (2016) and Majumder (2016) opined that establishment of community libraries would generally help information seekers.

Ways to improve PHT Information Access to Respondents.

The findings of this study on ways of improving accessibility and utilization of PHT information among WAE for effective agro-based entrepreneurship in Abia State as indicated from the responses of the respondents in Table 7, revealed that the ways of improving accessibility and utilization of PHT information among WAE for effective agro-based entrepreneurship in Abia State are through the use of local languages in the delivery of PHT information, regular visit and follow-up by extension agents, creation of more active agro-based women cooperative groups, provision of adequate incentives by government and Non-Governmental Organizations (NGOs) for the integration of PHT into agro-businesses, regular training workshops by Research Institutes on PHT, provision of subsidies on agro-based information sources, establishment of community libraries and more information centres closer to the people, introduction of more agricultural programmes on radio and television channels, and creation of radio and television channels dedicated to PHT information in Abia State as indicated by the respective pooled means of 2.76 and 2.77 for younger WAE and older WAE.

CONCLUSION AND RECOMMENDATION

The study established that there is a substantial extent of PHT information accessibility to younger and older WAE for effective agro-based entrepreneurship in Abia State, Nigeria.

The identified factors that influence the accessibility to PHT information by WAE for effective agro-based entrepreneurship in Abia State include: availability of radio set, ownership of mobile phone, knowledge of time to tune in for relevant radio and television programmes, availability of steady electricity supply to power electronic gadgets, and willingness of extension agents to teach about PHT in the local language. It was found that the PHT Information with

high extent of accessibility includes: preservation of harvested crops, value addition/processing of food, food packaging, and storage of agricultural products, quality control and distribution of agricultural commodities for effective agro-based entrepreneurship in Abia State. The study further showed that, there is no significant difference between the mean responses of younger and older WAE on the factors that influence the accessibility of PHT information for effective agro-based entrepreneurship in Abia State.

The study recommended that the ways of improving accessibility to PHT information among WAE for effective agro-based entrepreneurship in Abia State are through the timely use of local languages or dialects in the delivery of new improved PHT information, regular visit and follow-up by extension agents, creation of more active agro-based women cooperative groups, provision of adequate incentives by government and NGOs for the integration of improved PHT into agro-businesses. Finally, the study also recommended that regular training workshops by research institutes on improved PHT, provision of subsidies on agro-based information sources, establishment of community libraries and more information centres closer to the people, introduction of more agricultural programmes on radio and television channels, and creation of radio and television channels dedicated for PHT information are the ways of improving accessibility to PHT information among WAE for not only effective agro-based entrepreneurship in Abia State but also for proper adaptability and acceptance of the PHT Information in Abia State by the WAE.

Table 1: Mean responses of younger and older WAE on the extent of PHT information accessible to WAE for effective agro-based entrepreneurship in Abia State

Item No	Item Statement	Younger WAE $\overline{X_1}$	SD	Older WAE $\overline{X_2}$	SD	Decision
1	Post-harvest loss prevention of agricultural produce	3.25	0.80	2.87	0.69	HE
2	Preservation of harvested crops	3.22	0.79	2.73	0.65	HE
3	Conservation of agricultural commodities	1.73	0.31	2.14	0.46	LE
4	Quality control of foods	2.53	0.59	2.51	0.58	ME
5	Value addition/ processing of food	3.07	0.75	2.93	0.71	HE
6	Processing /value addition to non-food agricultural produce	3.20	0.79	2.73	0.65	HE
7	Food packaging	3.05	0.75	3.15	0.77	HE
8	Handling of agricultural produce	3.07	0.75	2.74	0.66	HE
9	Storage of agricultural products	2.99	0.73	3.26	0.81	HE
10	Quality standards, agricultural produce	2.98	0.73	2.92	0.71	HE
11	Consumer choice	3.23	0.80	2.74	0.65	HE
12	distribution of agricultural commodities	2.78	0.67	2.67	0.63	HE
13	Marketing regulations of agricultural commodities	2.37	0.54	2.12	0.46	LE
14	PHT training	2.39	0.55	2.34	0.53	LE
15	PHT empowerment programmes	2.23	0.49	2.37	0.54	LE
16	PHT credit facilities and capacity building	2.30	0.52	2.29	0.51	LE
17	PHT exhibitions	2.29	0.51	2.16	0.47	LE
	Pooled mean	2.75	0.66	2.63	0.62	HE

Source: Field survey, 2018. N= 264; ME = Moderate Extent; HE = High Extent; LE= Low Extent; PHT=Post-Harvest Technology; WAE=Women Agro-based Entrepreneurs

Table 2: t-test analysis of the mean responses of younger and older WAE on the extent of accessibility of PHT information for effective agro-based entrepreneurship

Variables	N	Mean	SD	Df	Standard Error	t_{cal}	t_{tab}	P-value	Remarks
Young WAE	132	2.75	0.62	262	0.08	1.52	1.97	0.13	Accepted Ho
Older WAE	132	2.63	0.57						

Source: Field survey, 2018; PHT=Post-Harvest Technology; WAE=Women Agro-based Entrepreneurs

Sources of PHT Information by Respondents.

Table 3: Mean responses of younger and older WAE on the sources of PHT information accessed by WAE for effective agro-based entrepreneurship in Abia State

Item No	Item Statement	Younger WAE		Older WAE		Decision
		$\overline{X_1}$	SD	$\overline{X_2}$	SD	
1	I listen to Radio programmes to get PHT Information and news	2.94	0.72	2.74	0.66	HE
2	I watch Television channels for PHT and other Information	3.05	0.75	2.99	0.73	HE
3	I read Newspaper and Magazine for information and leisure	2.18	0.47	2.26	0.50	LE
4	I see Poster, Banners and leaflets portraying PHT Information	2.36	0.54	2.43	0.56	LE
5	I call helpline centres for PHT Information via my Mobile Phone	2.39	0.55	2.37	0.54	LE
6	I browse the Internet using my phones and computers for PHT Information	2.33	0.53	2.37	0.54	LE
7	I have contacts with Extension Agents for information on PHT	2.65	0.63	2.75	0.68	HE
8	I communicate with Information officers and public Relation officer one on one and via mobile phone	2.77	0.66	2.62	0.62	HE
9	I discuss and share PHT information with Family members, friends and colleagues	2.94	0.71	2.85	0.69	HE
10	I get information about PHT in Village meetings	2.52	0.59	2.58*	0.61	HE
11	I visit the Community libraries to get information on PHT	2.18	0.47	2.26	0.50	LE
12	I get PHT Information Cooperative group meetings	2.73	0.65	2.75	0.66	HE
13	I read Books on PHT Information daily	2.36	0.54	2.43	0.56	LE
14	I read Journals on PHT Information	2.39	0.55	2.37	0.54	LE
15	I read Proceedings on PHT Information	2.33	0.53	2.37	0.54	LE
16	I read Research Annual Reports on PHT Information	2.16	0.47	2.32	0.53	LE
17	I read Dissertation on PHT Information	2.34	0.53	2.21	0.49	LE
	Pooled mean	2.51	0.58	2.51	0.58	ME

Source: Field survey, 2018. N= 264; *= varied weighted mean. ME = Moderate Extent; HE = High Extent; LE= Low Extent; *= varied weighted mean; PHT=Post-Harvest Technology; WAE=Women Agro-based Entrepreneurs

Table 4: t-test analysis of the mean responses of younger and older WAE on PHT information sources accessed for effective agro-based entrepreneurship

Variables	N	Mean	SD	Df	Standard Error	t_{cal}	t_{tab}	P-value	Remarks
Young WAE	132	2.51	0.58	262	0.07	0.01	1.97	1.00	Accepted Ho
Older WAE	132	2.51	0.58						

Source: Field survey, 2018; PHT=Post-Harvest Technology; WAE=Women Agro-based Entrepreneurs

Table 5: Mean responses of younger and older WAE on the factors that influence the accessibility to PHT information by WAE for effective agro-based entrepreneurship in Abia State

Item No	Item Statement	Younger WAE		Older WAE		Decision
		$\overline{X_1}$	SD	$\overline{X_2}$	SD	
1	Availability of Radio Set	3.02	0.74	2.97	0.72	Agreed
2	Ownership of mobile phone	2.63	0.62	2.61	0.62	Agreed
3	Knowledge of time to tune in for relevant radio and television programmes	2.54	0.59	2.57*	0.60	Agreed
4	Availability of steady electricity supply to power electronic gadgets	2.58	0.61	2.55	0.60	Agreed
5	Ability to read information in prints	2.73	0.65	2.63	0.62	Agreed
6	Willingness of Extension agents to teach about PHT in my local language	3.11	0.76	3.14	0.77	Agreed
7	My family members, friends and colleague are always available to give me any information I need	2.85	0.69	2.75	0.66	Agreed
8	I get information when I attend village and cooperative meetings	2.77	0.66	2.72	0.65	Agreed
9	Scarcity of PHT Information in my location	2.84	0.69	2.77	0.66	Agreed
	Pooled mean	2.79	0.67	2.75	0.66	Agreed

Source: Field survey, 2018. N= 264; *= varied weighted mean; PHT=Post-Harvest Technology; WAE=Women Agro-based Entrepreneurs

Table 6: t-test analysis of the mean responses of younger and older WAE on the factors that influence accessibility to PHT information for effective agro-based entrepreneurship

Variables	N	Mean	SD	Df	Standard Error	t_{cal}	t_{tab}	P-value	Remarks
Young WAE	132	2.79	0.67	262	0.08	0.49	1.97	0.63	Accepted Ho
Older WAE	132	2.75	0.66						

Source: Field survey, 2018; PHT=Post-Harvest Technology; WAE=Women Agro-based Entrepreneurs

Table 7: Mean responses of younger and older WAE on the ways of improving accessibility to PHT information among WAE for effective agro-based entrepreneurship in Abia State

Item No	Item Statement	Younger WAE		Older WAE		Decision
		$\overline{X_1}$	SD	$\overline{X_2}$	SD	
1	Timely use of local languages /dialects in the delivery of PHT information	2.64	0.62	2.69	0.64	Agreed
2	Regular visit and follow-up by extension agents	2.95	0.72	2.87	0.69	Agreed
3	Creation of more active agro-based women cooperative groups	2.72	0.65	2.67	0.63	Agreed
4	Provision of adequate incentives by Government and NGO for the integration of PHT into agro-businesses	2.65	0.63	2.73	0.65	Agreed
5	Regular Training Workshops By Research Institute on improved PHT	2.73	0.65	2.70	0.64	Agreed
6	Provision of subsidies on agro-based information sources	2.77	0.66	2.84	0.68	Agreed
7	Establishment of rural libraries and more information centres closer to the people	2.63	0.62	2.65	0.63	Agreed
8	Introduction of more agricultural programmes on radio and television channels	2.77	0.66	2.82	0.68	Agreed
9	Creation of radio and television channels dedicated to PHT information in Abia State	3.02	0.74	2.99	0.73	Agreed
	Pooled mean	2.76	0.66	2.77	0.66	Agreed

Source: Field survey, 2018. N= 264; PHT=Post-Harvest Technology; WAE=Women Agro-based Entrepreneurs

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ICTS AS FACTORS FOR INCREASED AGRICULTURAL PRODUCTIVITY

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ABSTRACT

Productivity increase has remained the cornerstone of agriculture in the developing world. The paper reviews the key areas where ICTs can increase agricultural productivity. The various areas of agriculture, agricultural policy, value chains and environmental sustainability where ICTs play a key role were highlighted. ICTs also play a strategic role in farm system efficiency by maximizing the resources for the greatest possible output. It was recommended that sustainability that is enhanced by ICTs should be incorporated into the long-term production goal of farmers. A sustainable environment increases the productivity of farmers, enhances the protection of the environment and ensures that resources have a longer shelf life.

Keywords: Information Communication Technologies, Agricultural productivity, digital technologies.

INTRODUCTION

The question of increasing agricultural productivity has become a concern for policy makers and researchers in Africa over the past recent decades. As the global digital economy continues to grow and influence all facets of our existence, agriculture is considered to be a key beneficiary of digital evolutions embedded in the fourth industrial revolution. Digital technologies in the management of agricultural production are a set of software methods for processing natural production information using technical means and computers (Aker, 2008; Aker and Mbiti, 2010).

The possibility of incorporating ICT tools in agriculture has been credited with the potential of accelerating national economic growth (Pande and Deshmukh, 2015). Digital agriculture adds value to the lives of farmers and end users in sustainable development through e-governance, knowledge management portals, e-kiosks and common service centres at grass root level (Behera *et al*., 2015). ICTs provide the platforms and capabilities for international monitoring development and validate conceptual models and methodologies in order to package and disseminate them once tested.

Digital technologies provide for financial inclusiveness of unbanked farmers and rural dwellers (Garcia Alba *et al*., 2007). This inclusiveness increases the scale of financial and assets and organizational structures at farm level. Furthermore, the social networks

that ICTs offer farmers create opportunities to scale up asset, institutions and structures by forming linkages between the local systems and meso/macro level organizations that play a key role in the provision of enabling environments for adaptation.

ICTs can be relied upon to strengthen institutions and organizations needed for the agricultural system to withstand the of climatic events, including the support of social networks and the facilitation of coordinated action (Duncombe, 2006). Verdouw *et al*. (2015) advance that an Enterprise Resource Planning (ERP) system is a standardized software package that combines functionality of multiple business functions into one integrated system. The system enhances the demand and supply of information between farmers and entrepreneurs (Kale *et al*., 2015 and Ramli *et al*., 2015).

Impacts of ICTs in Increased Agricultural Productivity

ICTs increase the production efficiency in agriculture through precision farming (Balafoutis *et al*., 2017; Schrijver *et al*., 2016). Precision farming is a modern agricultural model that uses sensors to optimize the use of pesticides, fertilizers and water. Modern precision farming uses GPS, as well as sensors, GIS technology and modern software. In 2020, precision farming technologies had an annual growth rate of 12%. The efficiency and effective management potentials provided by precision farming ensure greater productivity and reduced input wastage. Precision farming develops a firm environmental sustainability plan.

Transmission of important production information to farmers especially in developing countries through agricultural advisory services is enhanced by the ICTs. ICTs are relied upon for extension outreach and information transmission. Critical information such as weather forecasts, crop and livestock diseases and market prices for resources are always needed for strategic enterprise decisions (Allahyari *et al*., 2019; FAO, 2017).

The food system is closely linked to many issues, such as climate change, biodiversity loss, water and food shortages. This means that there exist environmental and sustainability imperatives for transition to sustainability in food systems (FAO, 2017; UNEP, 2018). Ensuring sustainability of development under conditions of rational nature management can be defined as long-term, multidimensional, and fundamental transformation processes through which established socio-technical systems transfer to more sustainable methods of production and consumption (Spaargaren *et al*., 2013). In agriculture, the concept of sustainable development implies a transition from an agri-food system, the main purpose of which is to increase productivity, to a system built on broader principles of sustainable agriculture (Bello and Aderbigbe, 2014).

ICTs Tools System Sustainability

ICTs increase the resilience of livelihood systems to recover from external shocks of climate change origins. Real life examples exist in rural India of ICTs available in Village Resource Centres that have connected rural dwellers to scientists, doctors, professors and government officials located in urban locations (Nanda and Arunachalam, 2009). This interlinkage has helped information assets availability such as weather forecasts and human capital such as e-health, e-extension and e-learning that have increased the ability of systems to bounce

back from climate and environmental situations.

Digital technologies have served to deepen the involvement of deepen the global trade participation of local markets in terms of supply chains and boosts local ecosystems' access to financial and physical assets as well as organizational structures. In this sense, ICTs can be said to increase the scale of resources available to local farmers by bring together the far and near assets through virtual interconnectivity. ICTs are used to create visual relations among resources, tenure, use and jurisdiction contributing to communities' ability to deal with climate change hazards and trends; an example is the 3-dimensional modelling in the Philippines that combines indigenous knowledge with GIS generated data in order to produce relief models (IAPAD, 2010).

CONCLUSION

ICTs have the capacity of improving agricultural ecosystems and productive capacities. ICTs improve management capacities and enable sustainable agricultural production while ensuring the safety of the environments. The ecosystem functionality that ICTs enable agriculture enhances a full-scale value chain functionality which provides access to global markets and the extra financial incentive to raise scale of production.

RECOMMENDATIONS

1. Digital platforms should be set up that help farmers make important and logical production decisions that will increase productivity.
2. It is critical to enhance the capacity of farmers towards the adoption of ICTs into their daily activities and farm level production plans.
3. Sustainability that is enhanced by ICTs should be incorporated into the long-term production goal of farmers. A sustainable environment increases the productivity of farmers, enhances the protection of the environment and ensures that resources have a longer shelf life.
4. Research should always be the basis for incorporation of ICTs into any agricultural system. The best technological combinations considering the prevailing circumstances should be brought into the system.

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DIGITAL TRAINING NEEDS FOR EXTENSION AGENTS REGARDING E-AGRICULTURAL EXTENSION

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ABSTRACT

Since digital extension is being considered as the best combination with the conventional extension delivery system in order to reach rural farmers with the best extension available. An active extension capable of shooting Nigeria to the realm of food security and self-sufficiency. The paper assesses the digital training needs for extension agents that will assist them deliver the best extension. The tools of digital extension need to be studied properly so that they can be applied perfectly toward agricultural extension delivery. Furthermore, the paper highlights the need for constant training and retraining of staff and realignment of the extension administration toward digital extension. It was recommended that a variety of ICT-based extension delivery techniques should be used in order to satisfy the demands of a heterogenous client base.

Keywords: Digital Agricultural Extension, ICTs, Extension delivery, E-agricultural Extension.

INTRODUCTION

Digital transformation of every sector of the economy remains key for the digitalization of any country. This is the beginning of the fourth industrial revolution – the digital era. Agricultural development and the transformation of the agricultural sector into a truly digitally proficient sector relies greatly on transformation of subsets of the sector. Agricultural extension is regarded as one of the most important subsets of the agricultural system due to its potential for altering the behaviour and productivity of farmers. Nevertheless, the effective output of extension workers depends on their level of preparedness and professional proficiency (Jasmin *et al*., 2013; Okoedo and Edobor, 2013; Hoffmann, 2014). Like any other organization, the continuous performance of extension organisations depends on the consistent training of its staff (FAO, 2001). Training needs for extension personnel can be defined in terms of the gap between job requirements and job performance (Mishra 1990). Majority of the extension agents perceive only low to medium training needs; therefore, necessary steps need to be taken in

order to identify and strengthen the skills, knowledge and competencies of extension agents that are covert in the extension agents' skill sets (Nongtdu *et al*., 2012). This is because a major limiting factor for successful training of extension workers in developing countries is the inadequacy of their training needs (Olatunji *et al*., 2015; Catherine *et al*., 2017).

There are more than 608 smallholder farmers around the word today and they feed a third of the global human population (FAO, 2021). However, it has been humanly impossible to reach all these farmers because they usually live in the most remote rurality with abundant land. Extension services are key to the improvement of the skills and capacities of this demography that are so important to our food supply. Evidences exist of ICTs contributing tremendously to the improvement of information transfer to rural farmers and concomitant behaviour changes (Bell, 2015). The role of information technologies especially those, which facilitate the process of communication is very crucial for bringing the socio-economic revolution. These technologies comprise of a wide range of devices, networks, services, applications, software, methods and technologies which are pivotal for storing, managing, processing, retrieving and communicating the information and are commonly identified with an umbrella term "Information and Communication Technologies".

The extension delivery system in Nigeria has been adjudged to offer obsolete information that are not even relevant to the farmer; the system itself is underfunded making it impossible to achieve its set mandates (Udemezue, 2019). Through ICTs, farmers have the opportunity of being part of the extension content to be offered to them and they can define the specificity of such content, they can also give feedback directly to the extension agency prompting a realignment of services offered in a quicker fashion.

Areas of ICT Training for Extension Personnel

Incorporating ICTs into extension systems is a novel area; therefore, extension agents need to be prepared in order to be able to deliver information to farmers that are relevant to their production needs and that reach them when they need it to. Certain key areas need to be ascertained or fixed when talking about extension agents' activities with ICTs. According to Vijayraghavan and Singh (2005) development of requisite competencies amongst the extension workforce within extension organizations is directly linked to training of extension personnel.

Content: Coding extension information for ICT-based extension is quite different from coding information for traditional extension delivery. The content needs to be brief and properly illustrated often accompanied by short videos and audio recordings. The administration and staffing of the extension organization need to arise to this new challenge. If extension delivery is to be properly carried out, it will depend on the mode by which the content is transmitted to the clientele/audience. Whatever content is transmitted should have space for direct feedback from the farmers. Tsan *et al*. (2019) discussed a phone-based farmers club called iShamba based in Kenya. This club hired professionals and researchers attended to the needs and problems of farmers anytime the call in, they also had SMS services offering information on weather, inputs and markets. Content should be designed on a case by case basis and based on priority areas.

Online Research Proficiency: ICT-based extension is much like instant messaging. There is the advantage of being able to research on the go while answering the questions or attempting to meet the demand of the clientele. This requires a rich storage of resources for the extension agents. The resources should be selected and kept in a database for easy access by the extension workers so that whenever a situation comes up, extension agents can easily reach out to the data base and fetch quick and accurate responses. For this, extension agents are required to have a rich and fast ability to navigate the database as well as the internet.

Improvement of Extension Agents' attitudes towards ICTs: Several studies (Kothari and Kameswari, 2021; Verma *et al*., 2012; Raksha *et al*., 2014; Baig, 2015; Gangadharan, 2015) have found that the attitudes of extension agents towards ICTs have been majorly neutral. Meaning that they are not exactly excited about ICTs. This attitude needs to be improved upon. That is why the entire agricultural extension system needs to be put through a digital transformation phase.

Mobile Phone and Internet Competencies: The Agricultural Development Programme (ADP) mostly relies on civil servants that may not be young and are generally not expected to be either technology-receptive or technology-savvy. However, the changing trend of ICT-based extension services requires the knowledge of technological devices and gadgets as well as other platforms. While training is required to bring all staff to the level of understanding digital extension service delivery, it may be advisable to develop an elite unit running the programme side-by-side the conventional staff.

Kothari and Kameswari (2021) assessed 7 major modules with different number of sub-modules in each of the main content areas in a research in India. First, ***introduction to ICTs in agricultural extension***; conventional ICTs such as newspapers, smart phones, television, landline telephones, magazines/journals, computers with internet, radio, simple mobile phones, laptops, tablets and computers without access to internet were all analysed under the ownership of media category and only tablets and fell short among extension supervisors and personnel.

Social media was very popular among both extension supervisors and personnel. There was positive response regarding use of email, WhatsApp, Facebook, YouTube, Twitter, LinkedIn, institutional websites, agricultural websites/portals, Instagram, web-based agricultural apps and expert systems. The key training needs identified here were Introduction to ICTs in Agricultural Extension, Role of computers in Agricultural Extension, Common software packages, Application of Mobile Phones in Agricultural Extension, Internet/ WWW/ e-mails /search engines in Agricultural Extension, Social media in Agricultural Extension and Digital content management.

Extension personnel also need to have a working knowledge of the prevailing agricultural extension system in the country, conventional media and methods of agricultural extension, recent advances in extension approaches, cyber extension/e-extension, advantages and disadvantages of using ICTs for extension activities as well as problems with use of ICTs.

Role of Computers in Agricultural Extension; this training need area should have such sub-modules as Overview of computer, Hardware, software and peripherals; Understanding the Operating systems; Attaching peripheral devices to computer; Open Source Software: installing and

updating; System for management of files/folders in computer; Basic functions: scanning, burning, compressing, zipping/ unzipping, format conversion, etc; Computer threats and malware; and Key terminologies related to computer.

Extension agents should also have a working knowledge of ***basic software packages***; packages that will help their work include MS Word: basic and advanced features of document preparation; MS Excel: Statistical computations and data presentation; Other statistical software: R, SPSS, SAS etc; MS PowerPoint: skills of preparing professional presentation; Introduction to Prezi for specialized presentations; MS Publisher: Preparing publications in various formats; Desktop Publishing Software: Pagemaker, Publisher, etc; MS Access: management of database; Working with MS Outlook: offline mail viewing platform and Graphic and drawing software: Corel Draw, Paint Pro, Illustrator, etc.

Application of Mobile Phones in Agricultural Extension; this is a most important aspect of digital agricultural extension delivery as extension of this digital nature needs to be mobile. Agents will be better if they received trainings in areas including History of development of Mobile applications for extension activities; Mobile phones v/s Computers in Agricultural Extension; Mobile Applications facilitating interaction-based Extension; Development of mobile applications; and Advantages and disadvantages of mobile applications.

Internet/ WWW/ e-mails/ search engines in Agricultural Extension: Understanding the basics of internet; Web browsers and search engine; Basics of navigation and searching in the internet; E-resources for Agricultural information; Overview of Google suite; E-mail service: Uses and features; Creation of online communities and discussion platforms; Safety issues, copyright and online ethics (netiquettes) and key terminologies related to the internet should all be focus areas for digital extension training.

Social media in Agricultural Extension: Introduction to social media; Use of social networking platforms for extension; Journalistic writing principles and techniques for social media; Content designing for Radio: Script writing and presentation basics; Content designing for Television: Story board and presentation skills; Skills of photography; Facebook, Twitter, Instagram, WhatsApp, Hike, Telegram, Messenger and other applications for Extension; Scope of social media platform for extension as well as Limitations and problems of social networking platforms.

Digital content management: An introduction to informational space on WWW; Agricultural knowledge management and WWW; Basics of web designing software: HTML, CSS etc; Creation of YouTube Channel; Introduction to blogs and skills of blog writing; Overview of Decision Support System; Development of an Expert system and Presentation, updating, promotion and uploading/downloading of digital content on WWW.

CONCLUSION.

Digital extension is a whole new ball game and the transformation of the conventional agricultural extension system should be done in a holistic manner starting from putting proper institutions, policies and finances in place. However, a critical limiting factor would be the proficiency of the extension staff themselves. This is why training and retraining of extension agents in digital

extension is paramount. The extension administration must deploy all strategies and resources to ensure that digital extension training is actualized for extension agents and supervisors.

RECOMMENDATIONS.

1. There is no doubt an overhaul of the working systems and principles of agricultural extension may be needed at some point, nevertheless parallel combination of the two systems may first be the best option.
2. Digital training of extension agents must start at the very beginning of the agents' careers and continue to be replicated throughout the span of their careers.
3. A variety of ICT-based extension delivery techniques should be used in order to satisfy the demands of a heterogenous client base. Where one fails another may succeed and where a client is not comfortable with one, they may opt for another option.
4. Training is one of the most critical aspects of agricultural extension, therefore, the administration must place premium on constant training. The funding of these ICT systems should be developed such that the system can be sustainable.

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AWARENESS AND USE OF IMPROVED SESAME PRODUCTION PRACTICES BY SESAME FARMERS IN PERI URBAN AREAS OF DUTSE, JIGAWA STATE, NIGERIA

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ABSTRACT.

This study was carried out to evaluate the awareness and use of improved sesame production practices in peri urban areas of Dutse, Jigawa State, Nigeria. Multistage sampling procedure was employed to select the respondents for the study from the five districts that make up peri urban areas of Dutse which are Hammayayi, Dole, Madobi, Katangar lafiya and Aikawa districts. Data were collected through the use of a structured questionnaires administered to 165 respondents out of which only 159 were found to be useful. Data collected were analyzed using frequencies, percentages, means and ranking. Finding from the study revealed that the mean age was 38.7 years. All were male, 85% were married and 76.7% had formal education. The mean household sizes, farm sizes and years of farming experience were 10 members, 2.2 hectares and 14 years, respectively. Main source of information used by the respondent was family and friends. Planting spacing for sesame was the practice that the respondents were most aware of and used while threshing and winnowing was the practice, they were most unaware of with least degree of usage by the sesame farmers. Non membership of association and lack of formal source of funds were the main problems observed in the study. The study recommended formation of association which could increase access to funding by governmental or non-governmental lending agencies and financial institutions.

Keywords: Awareness, sesame, practice, peri urban, Jigawa

INTRODUCTION.

Among the important oilseed crops widely grown in the world such as peanut, soybean, sunflower, sesame *(Sesamum indicum*) provides one of the highest and richest edible oils (Pathak *et al.* 2014). The major world producers include India, Sudan, China and Myanmar. These countries contribute about 60% of the total world production (El khier, Ishag , and Yagoub, 2008). Worldwide, there are over 4.8 million tonnes of the seeds produced yearly, with Myanmar being the largest producer. It is also one of main commercial crops in Nigeria, Sudan Nigeria and Ethiopia ranked first, second and third, respectively as the largest sesame producesr in the world (Adesanoye, 2018).

Sesame is quite extensively cultivated in Northern Nigeria with numerous varieties and ecotypes of sesame adapted to various ecological conditions Due to the drought-

resistant nature of the sesame plant, it thrives excellently in the Northern part of the country and averagely in some parts of South West. Sesame seed production probably began in the middle belt region of Nigeria before spreading to other states (Nzikou *et al*., 2010). Presently, about 26 states grow sesame, with Jigawa, Nassarawa, Benue and Taraba states being the largest producers. Sesame production is expected to increase, given the good prices obtained by farmers and increased demand worldwide (AgroNigeria, 2017). In Jigawa State, sesame is considered a major cash crop, as it occupies 34% of the total land area devoted to cash crop production in the state (NAERLS, 2015).

Sesame plays an important role in human nutrition where most of the sesame seeds are used for oil extraction and the rest are used for edible purposes their ability to add flavour or garnish foods, they were primarily used for cholesterol free oil. Also, after the extraction of oil, the cake is mostly used for livestock feed or as manure. Sesame seed is rich in fat, protein, carbohydrates, fibres and some minerals. Sesame also has numerous uses in pharmaceuticals, confectionery, cosmetics and many industries for paints, soaps, lubricants and shampoos, among others (Adesanoye, 2018).

In many developing economies Jigawa state inclusive, the low yield in agriculture has been attributed to the inability of the extension services to reach and address the immediate problems of farmers. Farmers' awareness of improved production techniques has been very low because extension has not been very effective in transmitting information on improved production technologies to farmers. Consequently, this makes farmers to continue to use technologies that have low yield potentials, low quality and late maturing. (Makama *et al.,* 2018). Despite the high commercial potentials of sesame in the nation's economy and its high nutritional values, research on the adoption of sesame production technology remains significantly scanty in the study area. Although sesame cultivation is on the increase in terms of areas cultivated, its full potential is yet to be explored in Nigeria due to lack of local farmers adherence to best farm practices suitable to its growth (Makama *et al.* 2018). Understanding farmer's use of a given technology as well as other crucial factors influencing adoption is crucial in the generation and diffusion of new technologies. However, there is a need for farmers to adopt improved production practices that involves enhancing sesame production by productivity improvements through the better adoption of improved technology. Adopting this improved production practices could lead to high seed yield and productivity of the crop and also leading to high farm income and improving the livelihood of the farmers. Owing to these reasons, it is therefore important to devote time and resources to study the awareness and use of improved sesame production practices by sesame farmers Jigawa State, Nigeria

The specific objectives of the study are to describe the socio-economic characteristics of the sesame farmers, sources of information used, and level of awareness and use of improved sesame production practices by the sesame farmers in the study area.

METHODOLOGY.

The study area is located between latitude 11°42′04″N and longitude 9°20′31″E. Dutse Local Government Area is bordered by Ringim and Jahun Local Government Areas to the North, Birnin Kudu Local Government Area to the South, Kiyawa and Gaya Local Government Areas to the East and West respectively (Aliyu, 2005). Dutse is the

administrative Headquarters of Jigawa State created on Tuesday 27, August, 1991 from the old Kano State.

The study area has a projected population in 2020 of 635,600 people (NPC, 2006). Dutse is currently the largest city in Jigawa State (Jigawa State, 2017). Dutse got its name from the rocky topography peculiar to the area. Different forms of rocks can be seen widely spread across the town. Mostly igneous in nature, the rocky town got its name from these naturally endowed resources, *Dutse* (Hausa term for rock). Dutse and its environs are well known for date trees (*Dabino*) of different varieties.

Jigawa state is the study area inclusive, is considered to be agrarian as more than 90% of the working adults engage in agriculture as a means of their livelihood (JARDA, 2005). With the availability of agrarian land, the inhabitants of Dutse are predominantly farmers and other occupations such as fishery, arts and crafts, menial jobs and civil service typical to peri urban areas are also available among the populace. Livestock herding is another economically important activity prevalent among people of the study area. The study area experiences two seasons namely the wet and dry seasons. The wet season is between June and October (4-5months) with August having the highest amount of rainfall (262mm). The average temperature is 30℃ with April being the hottest. The undulating relief of the area is covered by Sudan savanna. The populations of Dutse are predominantly Hausa and Fulani. Crops that are largely produced includes rice, sesame, millet, sorghum, groundnut, cowpea, among others.

The population for the study were sesame farmers. A sampling frame of the sesame farmers was obtained from the Jigawa Agricultural Development Association (JARDA). Multistage sampling procedure was used for the study, the first stage involved the purposive selection of five major sesame producing districts. These include Hammayayi, Dole, Madobi, Katangar lafiya and Aikawa districts. In the second stage three (3) sesame production communities were randomly selected from each of five major sesame producing districts while at the third stage involved random selection of eleven (11) respondents for enumeration in this study to give a sample size of 165 sesame farmers who served as respondents for this study. However, only 159 questionnaires representing 96.4% were found useful. Primary data were collected with the aid of a structured questionnaires, containing information such as the socio-economic characteristics of the respondents such as age, sex, level of education, household size and information on farm characteristics such as farm size, farming experience and land tenure system. Descriptive statistics was used to achieve objective was done using frequencies, percentages and weighted mean was used to achieve the objectives.

RESULTS AND DISCUSSION.

The result of the study from the Table 1 below shows that most (85%) of the respondents were married with 62.3% of them within the range of 20-40 years old, with mean age of 38.7. This result implies that most sesame farmers are within their economically active ages and are very agile. This should be able to translate to improved productivity of sesame in the area. This result is in agreement with Makama *et al*. (2011) in the study on sesame production in Jigawa state, Nigeria disclosed that most of the sesame farmers are young. Sex of the respondents also shows that only men are involved in producing sesame in the study area probably be as a result of the influence of customs and religion which mainly relegated women to mainly post-harvest

farming operations. The study also revealed that about 85% of the respondents have one form of formal education or the other indicating high level of literacy and agreeing with the findings of Muhammad *et al.* (2017) who reported that majority (84%) of the respondents have formal education in the study of determinants of adoption of improved production practices by rice farmers in Jigawa State. This could serve as potential for increased awareness and adoption of recommended practices among the rural people given that adoption of new technology is a function of education.

The mean farming experience and household size was 14.2 years and 9.8 persons, respectively implying more experience and available labour which could aid utilization of innovation as affirmed by Idrissa *et al.* (2010) since about 69.2% of the respondents had access to extension-to-extension services. Also, about 81% of the respondents had a farm size of less than 3 hectares with a mean farm size of 2.2 hectares. About half (53%) of the respondents acquired land through inheritance which agrees with Garba *et al.* (2020) who reported 57.7% of sesame farmers obtained land through inheritance. Over half (59%) of the respondents did not belong to any association with 71.1% of sesame farmers having personal savings as main source of funds agreeing with the findings of Debora (2009) who reported that majority (70%) of sesame marketers 70% acquires their funds through personal savings. Saved seeds (46%) and agro shops (32%) were the main sources of sesame seeds while sole cropping was practiced by about 70% of the respondents in the study.

Sources of Information on Improved Sesame Production Practices.

Table 2 below shows the result of sources of information used by the respondents. Family and friends (53.5%), radio (46.5%), and extension agents visits (34.6%) ranked first, second, and third respectively, as the major sources of information on improved sesame production practices used by the respondents in the study area. This finding agrees with that of Muhammad *et al*. (2020) where fellow farmers ranked first among sources of information used by maize farmers in Northern Guinea Savanna of Kaduna State. The use of radio which is the second largest source of information underlines the fact that radio remains an important means by which information are accessed by farmers of different categories.

Level of Awareness of Improved Sesame Production Practices.

New method of sowing sesame, high yield and non-shattering sesame varieties, planting spacing, pesticides and fertilizer used in sesame production, other agronomic practices such as improved harvesting, threshing, winnowing and storage techniques as well as raw sesame and sesame products marketing are the parameters used in the study.

Table 3 below shows the result for level of awareness and used of improved sesame production practices which indicated that only about half (52.2%) of the respondents were aware of all these practices. Specifically, the result revealed that 67.9% of the farmers were aware of the planting spacing for sesame, 62.9% were aware of land preparation practices for sesame, 60.4% were aware of pesticides and fertilizer used in sesame production, 52.2% were aware of improved sesame production techniques and 51.6% were aware of right harvesting techniques. These ranked first, second, third, fourth and fifth, respectively.

The sesame production practices the respondents were most unaware and unused of were best practice of threshing and winnowing (20.8%), good sesame storage techniques (18.2%) and high yield and non-shattering sesame seeds (17.6%).

Table 1: Distribution of Respondents based on Socio Economic Characteristics

Socio Economic variable	Frequency	Percentage	Mean
Age (years)			
≤20-40	99	62.3	38.7
41-50	24	15.1	
51-60	26	16.4	
≥61	10	6.3	
Sex			
Male	159	100	
Marital Status			
Single	24	15.1	
Married	135	84.9	
Level of Education			
Informal	37	23.3	
Primary	24	15.1	
Secondary	73	45.9	
Tertiary	25	15.7	
Years of Farming Experience			
≤5	22	13.8	14.3
6-10	47	29.6	
11-15	24	15.1	
16-20	26	16.4	
≥21	40	25.2	
Household size			
1-10	98	61.6	9.8
11-20	45	28.3	
21-30	15	9.4	
31-40	1	6	
Access to extension services			
Yes	110	69.2	
No	49	30.8	
Contact with Extension Agent			
No contact	49	30.8	
Fortnightly	7	4.4	
Monthly	15	9.4	
Quarterly	30	18.9	
Yearly	58	36.5	
Source of Land Acquisition			
Inheritance	84	52.8	
Rent	36	22.6	
Purchase	20	12.6	
Inheritance and rent	5	3.1	
Inheritance and purchase	10	6.3	
Rent and purchase	4	2.5	
Farm Size			
<0.5	10	6.3	2.2
0.5-0.9	12	7.5	
1-1.4	26	16.4	
1.5-1.9	18	11.3	
2-2.4	17	10.7	
2.5-2.9	54	34.0	
≥3	22	13.8	
Membership of Association			
Yes	66	41.5	
No	93	58.5	

Source of Funds		
Personal saving	113	71.1
Family and friends	10	6.3
Cooperative societies	10	6.3
Micro-finance banks	6	3.8
Personal savings, family and friends	12	7.5
Personal savings and cooperative societies	3	1.9
Personal savings and micro-finance bank	2	1.3
Family friends, and cooperative societies	3	1.9
Source of Sesame Seeds		
Agro shop	51	31.8
Government subsidized shops	14	8.9
Fellow farmers	15	9.5
Saved seeds	73	46.0
Others	6	3.8
Farming System Practiced		
Sole cropping	111	69.8
Mixed cropping	48	25.2

Source: Field Survey, 2021.

Table 2: Distribution of the Respondents based on Sources of Information on Improved Sesame Production Practices.

Source of Information	Frequency*	Percentage	Rank
Extension agent's visits	55	34.6	3rd
Radio	74	46.5	2nd
Television	23	14.5	8th
Print media	4	2.5	11th
Family and friends	85	53.5	1st
Neighbors	37	23.3	5th
Farmer's cooperatives	34	21.4	6th
Research institutes	17	10.7	9th
Internet	25	15.7	7th
Farmers training	46	28.9	4th
Demonstration	13	8.2	10th

Source: Field Survey, 2021

Table 3: Distribution of the Respondents Based on Level of Awareness and Use of Improved Sesame Production Practices.

Variables	Aware and Used	Somewhat Unaware	Not aware and Unused
Improved sesame production technique	83(52.2%)	61(38.4%)	15(9.4%)
New method of sowing sesame	61(38.4%)	75(47.2%)	23(14.5%)
High yield and non-shattering sesame seed	59(37.1%)	72(45.3%)	28(17.6%)
Planting spacing for sesame	108(67.9%)	47(29.6%)	4(2.5%)
Pesticides and fertilizer used in sesame production	96(60.4%)	48(30.2%)	15(9.4%)
Land preparation practices	100(62.9%)	32(20.1%)	27(17.0%)
Right harvesting techniques of sesame	82(51.6%)	61(38.4%)	16(10.1%)
Best practice of threshing and winnowing	58(36.5%)	68(42.8%)	33(20.8%)
Good sesame storage techniques	68(42.8%)	62(39.0%)	29(18.2%)
Sesame and sesame products marketing	71(44.7%)	69(43.4%)	19(11.9%)

CONCLUSION AND RECOMMENDATIONS.

The study found that sesame farmers were educated married adult male adults who raised sesame as a sole crop in mostly small farm lands that were mainly inherited. Most, are non-members of associations and used the informal sources of information as main sources of disseminating information of improved sesame production practices in the study. Planting spacing was the most notable practice used by the farmers while threshing and winnowing practices was the least production practice used by the sesame farmers. The study enlightening the farmers for synergy to enable them enjoy benefits of group dynamics to raise fund for the financing of their farming enterprises and also access credit from Government and Non-governmental institutions as more attention is normally given to associations than individuals.

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