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EXPLORING FARMER EDUCATION INITIATIVES FOR MITIGATING SOIL EROSION IMPACTS ON FOOD SECURITY IN IMO STATE, NIGERIA

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Abstract
This study explored farmer education initiatives for mitigating soil erosion impacts on food security in Imo state. It adopted a descriptive survey research design, with a population of 211, made up of all the Agricultural Extension Agents in the state. A researcher developed a questionnaire entitled" Farmer Education Initiatives for Mitigating Soil Erosion Impact on Food Security (FEIMSEIFQ) was used for data collection. The instrument was validated by three experts; one from each of Agricultural Education, Agricultural Extension and Measurement and Evaluation, all from Michael Okpara University of Agriculture Umudike, Abia State. The reliability of the instrument was established using Cronbach Alpha method and the test yielded a coefficient of 0.73. The instrument was administered by the researchers with the help of three research assistants. Data collected were analyzed using mean and standard deviation to answer the research questions. Decisions made were guided by the four-point response options of strongly Agreed (SA), Agree (A), Disagree (DA) and strongly Disagree (SD) with corresponding values of 4, 3, 2, and 1. The cut-off point was calculated as follows; items with mean value 2.50 and above were agreed, while those below were disagreed. Findings include seven causes of erosion in Imo state. These include among others; road construction activities make the land vulnerable to erosion (x=3.33), grazing of animals on farmland expose the land to erosion (x=3.11). Results also showed seven perceived impacts of soil erosion on food security in Imo state. They include among others, erosion pollutes nearby streams and kills aquatic organisms (x=3.88), erosion results to high cost of food (x=3.22). Other findings are seven farmer education initiatives that could be provided for mitigating soil erosion impacts on food security in Imo state. They are: teach farmers the modern and safe farming practices in order to reduce erosion and increase crop production (x=3.77), teach farmers about crop rotation and encourage them to practice same to reduce soil erosion impacts on crop production (x=3.61), among others. Based on this, the study recommended that Agricultural Extension Agents should organize training workshops for educating farmers on how best to control soil erosion impacts in Imo State.

Keywords: Farmer Education, Initiatives, Mitigating, Soil Erosion, Food Security.

Introduction

Farmers carry out many activities to ensure proper crop growth and development. These activities include clearing the farmland, ploughing, and planting crops. The farmers also carry out post-planting activities including clean-weeding which are detrimental to soil health. The soil is an important land resource for most, if not all farm activities. According to the Food and Agricultural Organization (FAO) (2015), about 95% of food is directly or indirectly produced on the soil. It contains important nutrients that are needed by crops for growth and development. Nortclif, *et al.* (2017) observed that the soil supports animal activities, and serve as a reservoir for plant nutrients and a medium for soil organisms to thrive. The organisms include earth worm, bacteria, and ants among others, which enhance crop production. Most food production takes place on the soil and these activities could dislodge the top soils and carry them to other places resulting in soil erosion.

Soil erosion is the gradual process that occurs when the forces of water and wind detach and removes soil particles from its original location to another (Agboola, *et al*., 2020). A number of factors are known to predispose the soil to erosion. They include land clearing, ploughing and sowing of crops

(Attamah, *et al.*, 2021). Other causes of erosion, according to Ugboh and Ulebor (2021) are tyres of tractor which make grooves and create channels on the farmland, grazing livestock which removes the vegetative cover from the land, road construction activities and building of house. Soil erosion is a major threat to food production.

Food is an important family need. It is needed for growth and development, work, maintenance of good health and so on (Ezema, 2017). It is a common knowledge that a hungry person cannot work effectively. Unfortunately, a lot of people do not have enough to eat; and this could result to stunted growth, diseases and even death (World Food Programme, 2016). The ugly food situation has attracted the attention of the United Nations. According to Umeakuka (2017), the United Nations rolled out a number of agenda, or a set of universally agreed goals called Sustainable Development Goals (SDGs) to address socio-economic challenges of the world, including food security. Umeaku (2017) explained Food Security as a measure of food availability and individual's ability to access the food to eat, adding that security exists when all people at all times, have access to sufficient and nutritious food that meet their dietary needs for active and healthy life. However, erosion has great impacts on food security.

The impacts of soil erosion on food security include decline in food production and availability, increase in land degradation, decrease in crop yield, flooding, desertification, famine, high cost of food and food products, decline in soils ability to yield (Takele, *et al.*, 2015). FAO (2015) further disclosed that the farm land may contain fertilizers, pesticides, insecticides and other farm chemicals which could be carried by erosion to pollute the land (Commonwealth of Pennsyvania, 2023). These impacts of soil erosion to food security also apply in Imo state. The researchers observed that many rural farmers lack proper education on the use of modern food production technologies and erosion control measures. Education is known to be the knowledge and skills that one gains from being taught or the process of acquiring these skills (Onuka, 2016). The researchers therefore consider farmer education as key to providing the farmers with information on how best to control soil erosion in Imo State.

Farmer education is the education of the farmers. According to Elia (2019), it is education programme or training given to farmers to enable them incorporate the latest scientific advances and technologies into their daily operation. Farmer education helps farmers to increase their operations, creates awareness of the benefits and risks inherent in both crops and animals' production and gives adequate knowledge on how to increase farm products (Onwukwe, 2012). It has therefore become necessary for Agricultural Extension Agents to teach farmers the impacts of erosion and how to address them. The agricultural extension agents are the major stakeholders in the education and training of the farmers in Imo state. Based on their expertise, they know various ways to mitigate the impact of soil erosion on food security. Mitigating soil erosion impacts on food security involves activities or actions aimed at reducing the harm caused by erosion on the soil. Farmers and agricultural agents use various initiatives to mitigate the effects of soil erosion on food security.

The word initiative is a strategy, plan, decision or action taken by someone to act and address an issue without waiting for anybody to direct him to do so. In the context of this study, initiative is a strategy adopted by Agricultural Extension Agents to teach farmers the best way to control erosion in order to achieve food security in Imo state. Among the farmer education initiatives are teaching farmers about: mulching, afforestation, soil conservation measures, zero tillage, intercropping, and mixed cropping (Allahyari & Sadeghzadeh, 2019). Elia (2019) stated that awareness about soil erosion should be created through conferences and government organized agricultural shows. With these and other initiatives in place, it is believed that soil

erosion impact on food security will be reduced to the barest minimum.

The government and people of Imo State at one time or the other have evolved various approaches to control soil erosion. These include the involvement of various erosion-control agencies, radio and television programmes among others. These activities have not effectively addressed the impact of soil erosion on food security because visits made by the researchers in parts of the state revealed that erosion is still a serious ecological problem and threat to food production. There are still patches of gully erosion and increasing high cost of food in the state. It is believed that proper education of the farmers on erosion issues could reduce soil erosion impacts for food security in Imo State, hence the study.

Purpose of Study

The purpose of the study was to determine the farmer education initiatives used for mitigating soil erosion impact on food security in Imo State. Specifically, the study sought to:

i. identify the causes of soil erosion in Imo State, Nigeria;
ii. determine the perceived impacts of soil erosion on food security in Imo State; and
iii. find out farmer education initiatives that could be used for mitigating soil erosion impact on food security in Imo State.

Research Questions

The following research question guided the study:

1. What are the causes of soil erosion in Imo State?
2. What are the perceived impacts of soil erosion on food security in Imo State?
3. What are farmer education initiatives that could be used for mitigating soil erosion impacts on food security in Imo State?

Methodology

The study adopted descriptive survey design. The design was chosen because it sought the opinions of Agricultural Extension Agents on erosion control initiates using questionnaire. The study took place in Imo State, Nigeria. Imo State is located in South Eastern Nigeria with its state capital at Owerri. The state is made up of three Agricultural Zones, namely Owerri, Orlu and Okigwe. It is bounded on the North by Ebonyi State, on the East by Enugu State, on the South by River State and on the West by Anambra State. Imo State is chosen for the study because farming is a major occupation of the people of the state. The population of the study was 211, made up of all the Agricultural Extension Agents in the state. The Agricultural Extension Agents are workers who have been trained to teach farmers to adopt new and better crop production and soil management practices. According to Daneji (2011), the extension agents receive training from the Agricultural Development Programme (ADP) in all fields of agriculture on a regular basis. ADP is the implementing organ of the Federal Ministry of Agriculture and Natural Resources. (ADP Headquarters, Imo State, 2022). The entire population was used for the study since it was small. An instrument entitled "Farmer Education Initiatives for Mitigating Soil Erosion Impact Questionnaire" was developed by the researchers and used for the study. The questionnaire has part 1 and 2. Part 1 was used to obtain information on personal characteristics of the Agricultural Extension Agents. Part 2 on the other hand, is divided into sections A, B and C. Section A was used to obtain information on causes of soil erosion, B – Impact of soil erosion on food security and C was used to get the opinions of respondents on initiatives for mitigating the impact of soil erosion on food security in Imo State.

The questionnaire was constructed using a 4-point response options of Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD), with corresponding value 4, 3, 2 and 1. The instrument was tested for reliability using Cronbach Alpha Method. A coefficient of 0.73 was obtained which was adjudged high enough to be reliable. Two hundred and eleven (211) copies of the questionnaire were administered and

retrieved by the researchers with the help of three research assistants. One hundred and ninety-six (196) copies of the questionnaire were retrieved giving a return rate of 93%. The data retrieved were analyzed using mean and standard deviation to answer the research questions with 2.50 as the cut-off point. Mean rating of 2.50 and above was accepted as Agree, while below that was Disagree.

Results

The results of the study were presented in Table 1 – 3 as follows:

Research Question 1

What are the causes of soil erosion in Imo State?

Table 1

Mean Ratings and Standard Deviation of Responses of Agricultural Extension Agents on the Causes of Soil Erosion in Imo State (n=196)

S/N	Causes of Soil Erosion	$\bar{X}$	SD	Remarks
1.	Erosion is caused by wrong methods crop production.	2.82	0.63	Agree
2.	Grazing of animals on farmland expose the land to erosion.	3.11	0.60	Agree
3.	Tractor tyres create grooves on farmland which leads to gully erosion.	2.71	0.70	Agree
4.	Deforestation exposes the land to erosion.	2.65	0.51	Agree
5.	Road construction activities make the land vulnerable to erosion.	3.39	0.54	Agree
6.	Bush burning removes the vegetative cover on farmlands and leads it to erosion.	2.57	0.46	Agree
7.	Clean weeding causes soil erosion.	3.02	0.69	Agree

Key: $\bar{x}$=Mean, SD=Standard Deviation, N=Number of Respondents

Table 1 reveals that all the seven items obtained mean scores above the cut-off point of 2.50. The implication is that the respondents agreed that the items are causes of soil erosion in Imo State. The standard deviation of the responses of the Agricultural Extension Agents on the seven items ranged from 0.46 to 0.70, indicating that the respondents were not far from the mean and from the opinions of one another in their responses.

Research Question 2

What are the perceived impacts of soil erosion on food security in Imo State?

Table 2

Mean Ratings and Standard Deviation of Responses of Agricultural Extension Agents on the Perceived Impacts of Soil Erosion on Food Security in Imo State (n=196)

S/N	Impact of Soil Erosion	$\bar{X}$	SD	Remarks
8.	Soil erosion results to decline in crop yield.	3.02	0.66	Agree
9.	Soil erosion often results to increase land degradation.	2.87	0.41	Agree
10.	Soil erosion decreases food availability.	3.01	0.45	Agree
11.	The impact of soil erosion results to high cost of food.	3.22	0.73	Agree
12.	Erosion reduces soil suitability for farming.	2.67	0.52	Agree
13.	Soil erosion pollutes nearby streams and kills aquatic organisms.	3.88	0.55	Agree
14.	Soil erosion increases rural urban migration.	2.34	0.61	Agree

Key: $\bar{x}$ = Mean, SD=Standard Deviation, N=Number of Respondents

Table 2 found that six out of seven items, obtained mean scores above the cut-off point of 2.50. The items are 8, 9, 10, 11, 12, and 13. This means that the respondents agreed that the items are the perceived impacts of soil erosion on food security. The standard deviation of the responses of the respondents on the six items ranged from 0.41 to 0.73, meaning that the respondents were not far from the mean and from the

opinions of one another in their responses. However, item 14 had a mean of 2.34 which is below 2.50, indicating that it is not a perceived impact of soil erosion on food security. The item also had a standard deviation of 0.60. This means that respondents were not far from the mean and from the opinions of one another in their responses.

Research Question 3

What are farmer education initiatives that could be provided for mitigating soil erosion impact on food security in Imo State?

Table 3

Mean Ratings and Standard Deviation of the Responses of Agricultural Extension Agents on Farmer Education Initiatives that could be Provided for Mitigating Soil Erosion Impacts on Food Security in Imo State (n=196)

S/N	Farmer Education Initiatives for Mitigating Erosion Impact	$\bar{X}$	SD	Remarks
15.	Educate farmers on zero or minimal tillage to help them reduce soil erosion impacts on food security.	3.56	0.55	Agree
16.	Teach farmers to adopt effective soil conservation measures.	2.76	0.67	Agree
17.	Organize conferences and workshops to teach farmers erosion control measures.	2.63	0.43	Agree
18.	Teach farmers about crop rotation and encouraging them to practice same to reduce soil erosion impacts on crop production.	3.61	0.61	Agree
19.	Encourage the farmers to participate in government organized agricultural shows.	2.93	0.47	Agree
20.	Retrain farmers on effective ways of weeding to reduce flooding on the farmland.	2.77	0.64	Agree
21.	Teach farmers the modern and safe farming practices in order to reduce erosion and increase crop production.	3.77	0.71	Agree

Key: $\bar{X}$= Mean, SD= Standard Deviation, N=Number of Respondents.

Table 3 reveals that all the seven items obtained mean scores above the cut-off point of 2.50. This means that the respondents agreed that the items are farmer education initiatives that could be used for mitigating soil erosion impacts in Imo State. The standard deviation of the responses of the respondents on the seven items ranged from 0.43 to 0.71, indicating that the respondents were not far from the mean and from the opinions of one another in their responses.

Discussion of Findings

Table 1 revealed causes of soil erosion in Imo State. They are: road construction activities make the land vulnerable to erosion (3.39), grazing of animals on farmland may expose the land to erosion (3.11), clean weeding causes erosion (3.02), wrong crop production methods (2.82), tractor tyres create grooves on farmland which leads to gully erosion (2.71), deforestation exposes the land to erosion (2.65), and bush burning removes the vegetative cover on farmland and leads to erosion (2.57). These findings are in agreement with Attamah, *et al.* (2021) who reported factors that could predispose the soil to erosion to include land clearing, ploughing and sowing of crops. The result also agrees with the submissions of Ugbor and Ulebor (2021) that tractor tyres create grooves which results to gully erosion.

Table 2 reveals perceived impacts of soil erosion on food security in Imo State. They are: pollution of nearby streams and killing of aquatic organisms (3.88), high cost of food (3.22), decline in crop yield (3.02), decreases food availability (3.01), increase land degradation (2.87) and reduces soil suitability for farming (2.67). The findings are in consonance with the opinions of Yemefack (2015) who opined that erosion is a major threat to food security. The results also affirm the submissions of Attamah, *et al.*

(2021) that erosion reduces soil fertility and crop yield.

Table 3 reveals farmer education initiatives that could be provided for mitigating soil erosion impacts on food security. They include: teach farmers the modern and safe farming practices in order to reduce erosion and increase crop production (3.77), teach farmers about crop rotation and encouraging them to practice same to reduce soil erosion impact on crop production (3.61), educating farmers on zero or minimal tillage to help them reduce soil erosion impacts (3.56), encourage farmers to participate in government organized agricultural shows (2.93), retrain farmers on effective ways of weeding to reduce flooding on the farmland (2.77), teaching farmers to adopt effective soil conservation measures (2.76) and organizing conferences and workshops to teach farmers erosion control measures (2.63). These findings agree with Allahyari and Sadeghzade (2019) who mentioned educating farmers on erosion control, zero tillage and agricultural shows as possible ways of teaching farmers about soil erosion impacts. The results also agree with submissions of Elia (2019) who suggested that awareness about erosion should be created to farmers through training workshops and conferences.

Conclusion

The study established some causes of erosion in Imo State as perceived by the Agricultural Extension Agents. It also established that erosion impacts negatively on food security. The study further established farmer education initiatives necessary for mitigating the impacts of soil erosion on food security in Imo state. The study therefore, has provided information on farmer education initiatives for mitigating soil erosion impacts on food security. The findings of this study would be useful in enhancing food production and availability in Imo State when used to develop ways to prevent the impacts of soil erosion.

Recommendations

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

1. Farmers in Imo state should avoid indiscriminate bush burning in order to reduce the impact of soil erosion on food security.
2. Ministry of Agriculture and other stakeholders should organize workshop and conferences to train farmers on the impact of erosion on their farms and its effect on food security.
3. Government should organize agricultural shows to expose farmers on the safe farming practices including erosion control strategies.

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BAG FARMING TECHNOLOGY SKILLS AND FACILITIES REQUIRED BY WOMEN FARMERS IN OKRO PRODUCTION FOR FOOD SECURITY IN ENUGU STATE

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Abstract
In most parts of Enugu State, many women farmers engage in okra production. These women are faced with problems of insecurity as a result of kidnapping and assassination by herdsmen. Most of the women and their labourers are sometimes kidnapped and killed while working in the farm. They therefore seek alternative ways of producing okra without endangering their lives. The study therefore identified skills and materials for bag farming as innovative technology in okra production required by women farmers for food security in Enugu State. Four research questions and corresponding hypotheses guided the study. The study adopted survey research design and was carried out in Enugu State. The population for the study was 5,703 made up of 23 lecturers and 5,680 women farmers. The sample for the study was 591 comprised of 23 lecturers and 568 women farmers. The entire population of lecturers was studied while incidental sampling technique was used to select 10% (568) of women farmers. The instrument for data collection was 104 item structured questionnaire validated by three experts. Cronbach Alpha method was used to determine the internal consistency of the items which yielded a coefficient of 0.85. Data was collected by the researchers and two assistants. Data collected were analyzed using mean to answer research questions, while t-test statistics was used to test the null hypotheses. The study found out that 32 facilities and 72 skill items were required in bag farming as innovative technology in okra production for food security in Enugu State. It was recommended among others that items and materials identified should be utilized for bag farming instead of risking lives going to farms in far places to produce okra.

Keywords: Okra production, innovative technology, bag farming

Introduction

In most areas of Enugu State, many households prepare different dishes with okra fruit. Okra (*Hibiscus esculentus*) is a vegetable crop cultivated mainly for its uses (Singh, *et al*., 2018). Okra is a tropical warm loving flowering plant highly valued for its finger-like green pods/fruits (Mudgal, 2020), and used especially for soups and stew preparation (Sharma 2016). Okra contains essential vitamins (B & C), minerals (potassium & calcium) low calories, high dietary fiber, low saturated fats, mucilage which improves digestion and immune system, manages blood sugar (Kruck, 2019). Okra serves as power-house for valuable nutrients, nearly half of which is soluble fiber in form of gums and pectin that help to lower cholesterol, reducing risks of heart diseases (Habtamu, *et al.*, 2015).

Okra production requires soil with almost neutral pH (6-8) and moderate nutrient (Lynn, *et al*., 2019). The land is prepared while seeds-soaked over-night are sown at close spacing of 45cm x 30cm (dry season) or 60cm x 45cm (rainy season). Soaking of seeds with 0.2% pesticide prevents seeds or seedlings from soil borne diseases. Seed rate is between 8- 22kg/ha with planting depth of 20-25cm (Kumar, *et al*., 2019). The crop matures within 30 to 60 days after flowering depending on species

and harvested with kitchen knife or bare hands when the pods are below 7.62cm long (Joe, 2021). In some cases, production activities of okra are performed with innovative technology.

Innovative technology is any new or better way of carrying out activities. Innovative technology is any new or improved process that significantly differ from indigenous practices (Mihaela 2019). It is the creation of new processes, products, services or methods which results in improving efficiency, effectiveness or quality (Peter 2017). In this study innovative technology is new and improved process of cultivating okra to meet demands of consumers without risking the life of women farmers and their labourers. Innovative technology reduces wastage, costs and boosts productivity through effective utilization of resources (Santhosh 2023). It enhances problem-solving and creative insight to view things in different perspective that leads to developing new product, refreshing strategy or finding ways to stay ahead of competitors (Nibusiness, 2023). Since innovative technology is new and improved, introducing it into okra production could boast productivity, provide creative insight in women farmers in different ways and solve problem of insecurity by adopting bag farming.

Bag farming also known as sack or vertical farming is a method of growing crops in soil-filled bags at the backyard of a residential house, roof top or other places whether in urban or rural areas (Agbaji, 2023). Sack farming is a unique intervention where farmers grow crops in sack/bags around their residential areas (Veggie, 2022). In sack/bag farming, there are materials required such as site, soil, seeds, water, bags/sacks (jute, polythene, kenef fiber bags) among others. Planting helps crops to yield high and maintain food security while preserving people's lives especially in areas with insecurity like Enugu State.

In Enugu State women farmers are faced with hunger and insecurity as a result of kidnapping raping and killings especially in farms. The women are no longer going to their farm lands for farming due to fear. Agbaji (2023) stated that scarcity of land and security challenges have given rise to adoption of sack farming as an alternative for agricultural land. Benoit, *et al.* (2022) indicated that to help household especially women in their role of family protection and balanced diet for children and entire family members, innovations that allow agricultural production around housing areas are more sustainable in the context of difficulty in assessing agricultural lands and amidst insecurity, challenges. Most of these women have their children and labourers kidnapped, raped and or killed while working in their farms. These women therefore seek alternatives to continue production of okra which is one of their sources of income without endangering their lives. Innovative technology that allows agricultural production around residential environment becomes a good alternative as it is difficult for women to access their farm lands. Bag farming is adoptable for vegetable crop production such as okra. Vertical/bag farming is good for crops that do not take long to mature (Agbota, 2017). Bag farming as innovative technology, if well implemented would serve as alternative to production of okra by women farmers in the State; hence this study.

Purpose of Study

The purpose of this study was to identify skills in bag farming as innovative technology in okra production required by women farmers for food security in Enugu state. Specifically, the study sought to identify the:

i. skills in planning for okra bag farming by women farmers as innovative technology for food security in Enugu State;
ii. materials required for okra bag farming by women farmers as innovative technology for food security in Enugu State;
iii. skills required by women in caring for okra plants growing in bags as innovative

technology for food security in Enugu State; and

iv. skills in harvesting and marketing of okra required by women farmers as innovative technology for food security in Enugu State.

Methodology

The study adopted survey research design and was carried out in Enugu State. Ponto (2015) defines survey research as the collection of information from a sample of individuals through their responses to questions. The population for the study was 5,703 made up of 23 lecturers from agricultural education Department, in two Universities in Enugu state (University of Nigeria Nsukka and Enugu State University of Science and Technology) and 5,680 women farmers in the study area. The sample for the study was 591 comprised of 23 lecturers and 568 women farmers. The entire population of lecturers was studied while incidental sampling technique was used to select 10% (568) of women farmers. The instrument for data collection was 104 item structured questionnaire developed from literature reviewed for the study. Each item in the questionnaire was assigned a four response options of Highly Required (HR), Averagely Required (AR), Slightly Required (SR), and Not Required (NR), with values 4, 3, 2, and 1 respectively. The structured questionnaire items were face validated by three experts, two from Department of Agricultural Education, and one from Department of Science Education (measurement and evaluation experts) all from University of Nigeria Nsukka. Cronbach Alpha method was used to determine the internal consistency of the items which yielded a coefficient of 0.85. Data collected by the researchers and two assistants were analyzed using mean to answer the research questions while t-test statistic was used to test the null hypotheses at 0.05 level of significance and 589 degrees of freedom. To take decision on the required item, real limit of numbers was assigned to the response options as Highly Required (HR) = 3.50-4.00; Averagely Required (AR) = 2.50-3.49; Slightly Required (SR) = 1.50-2.49: and Not Required (NR) = 0.50 -1.49. Therefore, any item with mean values as indicated was interpreted accordingly.

Results

The result of the study was generated from the research questions answered and hypotheses tested and presented in Tables 1-4.

Research Question 1

What are the skills in planning for bag farming for okra production required by women farmers as innovative technology for food security in Enugu State?

Table 1

Mean, Standard Deviation and t-test Analysis of the Respondents on Skills in Planning Required by Women Farmers for Okra Bag Farming

S/N	Items	LECTURERS			FARMERS			t-test	
		X_1	Sd_1	Rem	X_2	Sd_2	Rem.	p-value	Rem
1.	Identify business opportunities in okra production in using bags	3.04	0.82	AR	2.29	1.17	SR	.002	S
2.	Determine objectives to provide direction for okra bag farming	2.78	1.20	AR	1.50	0.57	SR	.000	"
3.	Forecast benefits or profits that accrue from okra farming business	2.52	0.99	AR	2.01	0.86	SR	.005	"
4.	Access options for okra bag farming business	3.04	0.82	AR	2.61	0.74	AR	.007	"
5.	Select the best and most applicable option for implementation in okra	2.65	1.03	AR	2.18	1.17	SR	.060	NS
6.	Identify customers or okra marketing outlets	2.61	0.99	AR	2.25	0.83	SR	.046	NS
7.	Determine channels of distribution of okra to the customers	2.74	0.96	AR	2.23	0.95	SR	.013	NS
8.	Determine appropriate records to keep okra bag farming business	2.78	0.90	AR	2.32	1.01	SR	.032	NS
9.	Transportation accessibility to customers based on road network	2.83	0.83	AR	2.38	0.97	SR	.029	NS
10.	Prepare budget for okra bag farming business	2.96	0.64	AR	2.41	1.02	SR	.012	NS
11.	Determine source of fund for implementation of okra bag farming	2.87	1.06	AR	2.33	1.20	SR	.033	NS
12.	Review objectives based on market demands and challenges for okra	3.13	0.87	AR	1.50	0.57	SR	.000	S
		2.83	**0.93**	**AR**	**2.16**	**0.92**	**SR**	**0.02**	

Key: Note: if p-value is less than 0.05 (i.e., the level of significance), the result is significant, otherwise not significant.

Data presented in Table 1 revealed that all the items as indicated by the responses of lecturers had mean values ranged from 2.52 to 3.13. These mean values were within the real limit of 2.50 to 3.49; indicating that all the identified skill items were averagely required in planning for bag farming for okra production by women farmers. Table 1 also showed that mean values of responses of women farmers ranged from 1.50 to 2.38 which were within the real limit of 1.50-2.49; indicating that one of the items (No 4) was averagely required while the remaining 11 items were slightly required for planning for bag farming. Generally, all the items were required for bag farming as indicated by overall values of 2.82 and 2.16. The standard deviation values of the 12 items ranged from 0.64 – 1.20 (lecturers) and 0.57-1.20 (women farmers); these values were less than 1.96; indicating that the two groups of respondents were close to the mean and to each other in their responses.

The P-value of seven items were more than 0.05 while the remaining five items had their p-values less than 0.05. Therefore, the null hypothesis of no significant difference was upheld for seven items (5,6,7,8,9,10

&11) but not upheld for the remaining five items 1, 2, 3, 4, and 12.

Research Question 2

What are facilities required in bag farming for okra production by women farmers as innovative technology for food security in Enugu State?

Table 2

Mean, Standard Deviation and t-test Analysis of Respondents on Facilities Required in Okra Bag Farming

S/N	Items	LECTURERS			FARMERS			t-test	
		X_1	Sd_1	Rem	X_2	Sd_2	Rem	p-value	Rem
1	Suitable flat/level ground/site at the backyard/front, garden, roof top	2.96	0.82	AR	2.41	0.99	SR	.010	NS
2	Cutlass, rake, hoe, shovel, spade, trowel for clearing and levelling	3.30	0.63	,,	2.89	0.81	AR	.017	NS
3	clean sacks/bags free from impurities	2.60	1.00	,,	1.91	1.16	SR	.005	NS
4	kitchen knife	3.00	0.90	,,	2.56	0.88	AR	.019	NS
5	Animal droppings/compost manure	2.87	0.63	,,	2.30	0.91	SR	.003	S
6	Water	2.87	0.87	,,	2.34	1.01	,,	.013	NS
7	Weighing balance	2.74	0.81	,,	2.27	0.93	,,	.018	NS
8	5o liter gerican (empty)	2.96	0.88	,,	2.46	1.18	,,	.049	NS
9	Organic liquid manure	2.83	0.89	,,	2.14	1.12	,,	.004	S
10	Stop watch/Clock	3.13	0.92	,,	2.58	1.12	AR	.020	NS
11	Top soil (sand-loam high in organic matter	3.48	0.90	,,	1.73	0.87	SR	.000	S
12	Plastic empty can/swan can/PVC pipe 3 inches	3.00	0.67	,,	2.59	0.78	AR	.015	NS
13	Pebbles	3.17	0.78	,,	1.50	0.42	SR	.000	S
14	Supporting rod/piece of wood 20mm	3.49	0.59	,,	1.96	0.90	,,	.000	S
15	Absorbent-waterproof tray	3.26	0.75	,,	2.79	1.04	AR	.011	NS
16	Small sizable empty container/bowel	2.87	0.97	,,	2.31	0.99	SR	.008	NS
17	Okra seeds	2.96	0.88	,,	2.24	1.16	,,	.004	S
18	Sieve	2.91	1.20	,,	2.37	1.29	,,	.043	NS
19	Sharp stick	3.27	0.34	,,	1.76	0.89	,,	.000	S
20	Clean jute/sisal bag	2.78	0.74	,,	2.98	0.63	AR	.070	NS
21	Dried Grasses/plant leaves for mulching	2.70	0.63	,,	1.51	0.42	SR	.000	S
22	Watering can	2.91	0.42	,,	1.87	0.97	,,	.032	NS
23	Herbicides	2.87	0.81	,,	2.36	1.00	,,	.016	NS
24	Pesticides	3.13	0.63	,,	2.73	0.88	AR	.029	NS
25	Small Hoe or hand trowel	3.43	0.84	,,	2.87	0.98	,,	.007	NS
26	Protective cloths- thick-hand-gloves, hat, gown, trousers, long sleeve	3.17	0.94	,,	2.50	1.16	,,	.006	NS
27	Oil (palm oil, vegetable oil or Vaseline)	3.30	0.70	,,	2.48	1.25	SR	.002	S

28	Spreading sheet	3.39	0.78	,,	2.63	1.19	AR	.003	S
29	Basket/basin/bag (different sizes)	2.61	0.78	,,	2.59	0.67	,,	.190	NS
30	Wheelbarrow. Bike, tricycle, vehicle	3.28	0.95	,,	1.52	0.40	SR	.000	S
31	Shop/open market	2.83	0.72	,,	2.17	0.76	SR	.000	S
32	Small waterproof bags	2.87	0.34	,,	1.72	0.63	SR	.000	S
		3.03	**0.77**	**,,**	**2.26**	**0.92**	**SR**	**0.02**	

Data presented in Table 2 revealed that all the 32 items were required in okra production. These values ranged from 2.60-3.49 (lecturers) and 1.52-2.89 (women farmers). These values were within 1.50 – 4.00, indicating that the 32 items were facilities required in bag farming. The standard deviation (SD) of all the 32 items ranged from 0.34 to 1.25 for both respondents; indicating that the respondents were not far from the mean and from one another in the responses.

Table 2 further revealed that 13 out of 32 items had p-values ranging from 0.00-0.04. These values were less than 0.05 indicating significant difference between the two groups of respondents while 19 items have p-values greater than 0.05 (0.05-0.19) which means that there is no significant difference in the mean rating of lecturers and women farmers on the facilities required in bag farming. Therefore, the null hypotheses of no significant difference was accepted for each of the 19 items, while null hypotheses of no significant difference was not upheld for the 13 items.

Research Question 3

What are skills in field operation for okra plants growing in bags as innovative technology in okra production by women farmers in rural areas of Enugu State?

Table 3

Mean Rating, Standard Deviation and t-test Analysis of the Two Groups of Respondents on Skills Required in Field Operation for Okra Plants Growing in Bags as Innovative Technology in Okra Production by Women Farmers in Rural Areas of Enugu State

S/N	Item Statements	LECTURERS			FARMERS			t-test	
		X_1	Sd_1	Rem	X_2	Sd_2	Rem	p-value	Rem
1	**Preparation for Okra Cultivation** Select suitable flat/level land at backyard, garden, roof top, or frontage of residential area	2.65	0.78	AR	2.19	0.90	SR	.015	NS
2	Select a sand-loam soil high in organic matter to gather the top soil	2.78	0.95	,,	2.16	0.91	,,	.001	S
3	Clear the site with cutlass	2.83	0.83	,,	2.06	0.95	,,	.000	S
4	Gather grasses cleared with rake	2.96	0.93	,,	2.44	1.09	,,	.027	NS
5	Stump the cleared land with pick axe	2.91	0.73	,,	2.68	0.93	AR	.237	NS
6	Level the stumped land with hoe, shovel, spade	3.00	0.60	,,	2.47	0.80	SR	.002	S
7	Get clean sacks/bags free from impurities	2.87	0.81	,,	2.19	1.08	SR	.003	S
8	Perforate 2mm holes at the two sides and bottom centre of each sack with kitchen knife	3.09	0.73	,,	2.69	0.81	AR	.021	NS

9	Dissolve animal droppings or compost in water to get organic liquid manure	3.22	0.67	,,	2.59	1.16	,,	.011	NS
10	Put poultry droppings or pig manure inside bags	2.78	0.74	,,	2.52	0.89	,,	.158	NS
11	Weigh each bag to measure out 25kg	2.70	0.70	,,	2.24	0.90	SR	.018	NS
12	Soak the 25kg of poultry droppings or pig manure to 50 liters of water over-night (12 hours)	2.65	0.71	,,	2.14	0.80	,,	.002	S
13	Soak 30 pieces of perforated empty bags in organic-liquid manure for 24 hours	2.96	0.93	,,	2.13	1.14	,,	.001	S
14	Gather top soil from the selected sand-loam soil high in organic matter.	2.87	0.92	,,	2.29	1.24	,,	.028	NS
15	Mix gathered top soil and poultry droppings or pig manure with shovel/spade at 50:50 ratio	3.35	0.88	,,	2.71	1.06	AR	.005	S
16	Bring out the perforated bag from the organic liquid manure	2.91	0.51	,,	2.22	0.94	SR	.001	S
17	Fold the edge of the bag to allow for easy filling with mix soil	3.09	1.20	,,	2.74	1.07	AR	.128	NS
18	Get big empty plastic bottled water, or pieces of PVC pipe	3.61	0.66	,,	2.17	1.31	SR	.000	S
19	Cut off the top and bottom of big empty plastic bottled water	3.13	1.01	,,	2.45	1.21	,,	.008	S
20	Place plastic can or pieces PVC pipe at the center of the bag as support inside the bag	3.26	0.62	,,	2.87	0.79	AR	.019	NS
21	Fill the plastic can or PVC with pebbles	2.87	0.81	,,	2.41	0.84	SR	.010	NS
22	Fill the surrounding areas of the can or PVC with soil mixed with manure	3.43	0.84		2.72	1.19	AR	.004	S
23	Lift plastic can or PVC to stand on the newly laid layer	3.17	0.98		2.30	1.28	SR	.001	S
24	irrigate at this level for soil to evenly moist	3.04	0.71	,,	2.66	0.86	AR	.033	NS
25	Support the bag with piece of rod or wood at the side if need be	3.09	1.12	,,	2.52	1.18	,,	.023	NS
	Viability Testing to Select Healthy Seeds for Planting								
26	Place a water absorbent inside a waterproof tray	3.04	0.93	,,	2.67	1.11	,,	.114	NS
27	Take random samples from each seed lots and mix in a container	3.00	0.95	,,	2.43	1.14	SR	.018	NS
28	Take at least three seeds from the mixed seeds.	3.17	0.83	,,	2.67	1.10	AR	.029	NS
29	Count out 100 seeds from the sample and place on the absorbent material inside the tray.	2.87	0.63	,,	2.28	0.98	SR	.005	S

30	Saturate the absorbent material with water.	2.65	0.65	,,	2.28	0.82	,,	.030	NS
31	Leave for some days (3 to 4) to imbibe water to germinate.	2.70	0.70	,,	2.12	0.90	,,	.003	S
32	Soak the tested seeds in water for three (3) hours.	3.35	0.98	,,	2.96	0.89	AR	.043	NS
33	Remove the floated seeds with sieve	2.83	0.94	,,	2.17	1.15	SR	.007	S
34	Put the seeds in a bag for sprouting.	3.09	1.04	,,	2.45	1.20	,,	.012	NS
35	Place the bag with soaked seeds on the warm compost or ground.	2.87	0.69	,,	2.51	0.92	AR	.063	NS
36	Cover the bag containing soaked seeds completely with compost or soil.	2.65	0.83	,,	2.15	0.86	SR	.006	S
37	Warm slowly by bringing the bags under very low heat sun to enhance sprouting.	2.87	0.76	,,	2.24	1.10	SR	.007	S
38	Determine germination rate by dividing number germinated by number of seeds tested X 100.	2.70	0.82	,,	2.16	0.91	,,	.006	S
	Skills in Sowing Operations								
39	Make holes with sharp stick or cutlass on the soil filled bags for planting	3.00	1.04	,,	2.63	1.09	AR	.109	NS
40	Sow pre-germinated seeds (2-3)/holes in prepared soil filled bags with sharp stick/ cutlass	2.96	0.98	,,	2.39	1.06	SR	.013	NS
41	Close the holes with bare hand or cutlass/stick	3.48	0.85	,,	2.94	0.97	AR	.010	NS
	Skills in Caring for Okra Growing in Bags								
42	Mulch lightly by spreading dried banana leaves/grasses/palm front over sown seeds/seedlings	2.65	0.65	,,	2.13	0.93	SR	.008	S
43	Irrigate sown seeds morning and evening to maintain moisture content when necessary.	2.91	0.29	,,	2.35	0.93	SR	.004	S
44	Remove weeds with bare hand, hoe /cutlass or use herbicides 3-4 weeks after planting.	3.35	0.49	,,	2.99	0.70	AR	.014	NS
45	Repeat weeding 6-7 weeks after planting if need be	3.00	0.67	,,	2.60	0.78	AR	.016	NS
46	Apply pesticide if need be	2.87	0.76	,,	2.32	1.08	SR	.016	NS
47	Irrigate field/farm in area with insufficient rainfall. Use any irrigation method desired	2.96	0.93	,,	2.37	1.10	SR	.013	NS
		2.98	**0.80**	**,,**	**2.43**	**1.00**	**SR**	**0.03**	**S**

Data presented in Table 3 revealed that the mean responses of both lecturers and women farmer ranged from 2.12 to 3.61. These values were within 1.50 to 4.00; indicating that the items were skills in field operation for okra production. Table 3 also revealed that the standard deviation (SD) of the items ranged from 0.29 to 1.31 which were below 1.96. Thus, indicating that the

respondents were close to one another in their responses.

Table 3 further showed that 20 out of 47 items had their p-values less than 0.05 indicating significant difference in mean ratings of the two groups of respondents while 27 items had p-values greater than 0.05, which mean no significant difference in the mean rating of lecturers and women farmers on the skills in field operation for okra plants growing in bags as innovative technology in production. Therefore, the null hypotheses of no significant difference was upheld for each of the 20 items, but rejected for each of the 27 items with significance difference.

Research Question 4

What are the skills in harvesting and marketing of okra grown in bag as innovative technology in okra production by women farmers for food security in Enugu State?

Table 4

Mean Rating on Skills in Harvesting and Marketing of Okra Grown in Bags as Innovative Technology in Okra Production by Women Farmers for Food Security in Enugu State

S/N	Items	LECTURERS			FARMERS			t-test	
		X_1	Sd_1	Rem	X_2	Sd_2	Rem	p-value	Rem
1	Determine maturity through observation of the fruit length at 2cm	2.96	0.93	AR	2.43	0.97	SR	.010	NS
2	Put on protective cloths to prevent against itching of hairy particles from the plant	2.74	0.86	,,	2.24	0.93	,,	.012	NS
3	Rob oil to protect against itching on palms	3.00	0.52	,,	2.49	0.92	,,	.008	S
4	Spread jute materials for packing harvested okra pods	2.65	1.15	,,	2.06	1.26	,,	.026	NS
5	Harvest tender green pods with bare hand or kitchen knife and avoid injury to the plant	3.22	0.74	,,	2.37	1.19	,,	.001	S
6	Gather harvested okra pods on the spread sheets/materials with container-basket/bowel	3.26	0.45	,,	2.87	0.65	AR	.005	S
7	Sort harvested okra to remove the over matured or immature ones	2.87	1.06	,,	2.41	0.89	SR	.016	NS
8	Pack in different sizes of baskets, basins, bags/sacks for easy transportation	2.78	1.00	,,	2.23	1.06	,,	.014	NS
9	Transport packed harvested okra pods for market to sell using appropriate means	3.13	0.81	,,	2.74	0.83	AR	.028	NS
10	Off load and display in open market/shops for sale	2.96	0.93	,,	2.24	1.25	SR	.007	S
11	Sell to customers according to demand	3.09	0.79	,,	2.38	1.14	,,	.003	S
12	Collect money at the point of sale	2.87	0.92	,,	2.31	1.04	,,	.012	NS
13	package goods for customers in appropriate waterproof bags	2.74	0.96	,,	2.23	1.02	,,	.020	NS
		2.94	**0.86**	**,,**	**2.38**	**1.01**	**,,**	**0.01**	

Data in Table 4 revealed that all the 13 items had their mean values ranged from 2.02 to 3.26 from the two groups of the respondents. The values were above the real limit of 1.50; showing that all the 14 items were skills required in harvesting and marketing of okra by women farmers. Table 4 also indicated that five out of 13items had their p-values less than 0.05 while eight items had their p-values greater than 0.05. Therefore, the null hypothesis of no significant difference was upheld for five items and rejected for the remaining eight items.

Discussion of Findings

The study found out in Table 1 that using bags within the environment, determine objectives to provide direction for okra bag farming, forecast benefits or profits accruing from okra farming business, access options to okra bag farming business, select the best and most applicable option for implementation, identify customers or okra marketing outlets, among others were the planning skills required for bag farming. The findings of the study in this direction were in consonance with the findings of Ahmed (2016) in a study on steps to develop an effective marketing communication strategy, online publication, where the author found that know audience, uncover unique selling proposition, ensure consistent messages, choose market mix, ensure market effectiveness, manage leads and client data were needed. The findings of the study were further in conformity with the findings of Nwankwo, *et al.* (2022) in a study on emerging initiatives for enhancing entrepreneurship performance of women in marketing Nsukks yellow pepper for combating insecurity in Enugu State where the authors indicated that reward customers occasionally, use customer services to buy their products, appreciate customers and return phone calls, among others were required.

The findings of the study as presented in Table 2 revealed that bag farming as innovative technology in okra production required items like, suitable flat/level site in the immediate environment, cutlass, rake, hoe, shovel, trowel etc., clean sacks/bags kitchen knife, animal dropping, compost manure, water weighing balance, organic liquid stop watch clock, pebbles, soil among others. These findings are in line with the findings of Agbaji (2023) that outlined the facilities needed in bag farming as site selection, bags, soil or other growing medium, organic fertilizer, crops to plant, staking nets or rope, stones or pebbles. The study was further consonant with the findings of Veggie Grow (2022) on sack faming – a step by guide where the author found site selection, bags or sacks, soil or other growing medium, manure or compost, crops to plant, fertilizers, pesticides, stones or pebbles, staking net /stick or ropes among others as facilities needed for bag/sack farming.

The study found in Table 3 that: select suitable flat land around residential area, select a sand-loam soil high in organic matter to gather soil, clear the selected site, gather the grasses with rake, stump the cleared land with pick axe. Level the stumped land with shovel or spade, get clean sac/bags free from impurities, make 2mm holes at the two sides and bottom centre of each bag with kitchen knife among others as skills required in field operation for okra plants growing in bags as innovative technology in okra production by women farmers in rural areas of Enugu State. The findings of the study are in line with the findings of 247 Garden Blog (2023) where the author found that select site near residential or suitable place, gather sack, choose high quality well-drained spotting soil suitable for container, get manure preferably organic, fill sacks/bags with mix soil and organic manure, place the sacks/bags where they can get enough sunlight for their growth, water appropriately, if need be, among others as skills in sac/bag farming. The findings of the study are also supported by IFFCO Bazar (2023) on how to plant vegetable in a bag where the author found that choose right grow bag, fill the grow bag with potting mix, choose the plant/crop, plant the crop, water, if need be, among others.

Furthermore, the findings of the study with respect to Table 4 showed that determine maturity through observation of the fruit length at 2cm, put on protective clothing – hand gloves, head cover, trousers and long sleeve etc. to prevent against itching of hairy particle from okra plant, rob oil on the palm against itching, spread jute material for packing harvested okra pods, harvest tender green okra pods, gather the harvested okra, sort harvested okra, park in different sizes bags and basket for easy transportation amongst others were the skills in harvesting and marketing of okra grown in bag as innovative technology in okra production by women farmers for food security in Enugu State. These skills were in agreement with findings of Andrew (2023) where it was found that harvest when pods are 2 – 3 inches (5.1 to 7.6 cm) long, harvest every other day, wear protective clothing – hand gloves, head cover, trousers and long sleeve shirt when harvesting to prevent the hairy particles from itching were required. The findings is consonant with the findings of Brandenberger, *et al.* (2019) on the okra production where the authors found that harvest 3 -4 inches length depending on the variety, wear gloves, long sleeve shirt and long pants to avoid skin irritation caused by short spine on the fruits, harvest with bare hand, sharp knife or shears, remove over matured pods from the plant to maintain production, spread sheet/jute material to precool with cold air and remove field heat, pack lightly on small, medium sized bags to avoid bruises. The finding is also in line with the findings of Arah, *et al.* (2016) on post harvesting, handling practices and treatment methods for tomato handlers in developing countries where the authors revealed that handling practices like harvesting, cleaning, sorting and grading, packaging and transportation were the skills in harvesting and marketing of tomatoes.

Conclusion

Okra production is a lucrative business by women in Enugu State. The demand of the product is higher than supply as a result of insecurity in the state and its environs. The women engaged in okra production are faced with insecurity challenges, some are kidnapped, raped and even killed while working in their farms. This study was therefore carried out to identify bag farming as innovative technology in okra production. The study identified 104 items (12 for planning, 32 facilities required, 47 field operations and 13 harvesting and marketing skills) of okra plant grown in bags by women farmers for food security in Enugu State.

Recommendations

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

1. The identified skills in bag farming as innovative technology for okra production should be incorporated into the farming packages used by extension officers.
2. The identified skills should be used in training women farmers by extension officers.
3. Government should provide soft loan for small scale farmers (women) for sustainability.
4. Soil should be utilized in bags in place of soil medium, in open fields in okra production.

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ORGANIC FARMING SKILLS NEEDED BY FARMERS FOR IMPROVED FOOD SECURITY IN BENUE STATE, NIGERIA

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Abstract
The study focused on organic farming skills needed by farmers for improved food security in Benue state, Nigeria. It adopted survey design. The population for the study was 291 comprising 268 Farmers and 23 Agricultural Extension Agents. The entire population was involved for the study. The instrument for data collection was a 58-item structured questionnaire titled: Organic Farming Skills Needed by Farmers Questionnaire (OFSNFQ). It was validated by three (3) experts from the Departments of Educational Foundation and General Studies (EFOGENS)-Test and Measurement, Crop production, and Agricultural Extension all from the Joseph Sarwuan Tarka University, Makurdi for content and face validity. Corrections and observations made by validators were used to produce the final copy of the instrument. The instrument was trial tested in Benue state, Nigeria. Cronbach Alpha reliability method was used to determine the internal consistency of the instrument and a reliability coefficient of 0.88 was obtained. Mean was used to answer research questions, while t-test statistics was used to test the null hypotheses at 0.05 level of significance. Findings revealed that farmers needed 20-items in manuring, 12-items in crop rotation, 7-items in crop residues, 10-items in composting and 9-items in biological pest control in organic farming for improved food security. The study recommended among others that, agricultural extension agents should retrain organic farmers for improved food security using the identified organic farming practices and the identified organic farming practices could be replicated for the production of other agricultural practices.

Keywords: Organic Farming, Skills, Farmers, Improved Food Security, Covid-19, Benue State, Nigeria

Introduction

Organic is a term that is best thought of as referring not to the type of inputs used, but to the concept of the farm as an organism in which all the components (the soil minerals, organic matter, micro-organisms), are self-regulating and stable whole (Lampkin, *et al*., in Mashood, 2009). Organic farming is a comprehensive management approach to improve the health of underlying productivity of the soil (Bhattacharyya & Chakraborty, 2005). Organic farming according to FAO/WHO. codex Alimentarius Commission (2007) is an integrated production management system that promotes and enhances agro-ecosystem, health, biodiversity, biological cycles and soil biological activity. Organic farming is a production system, which avoids or largely excludes the use of synthetic compounded fertilizers, pesticides, growth regulators and livestock feed additives. Bhattacharyya and Chakraborty (2005) said organic farming relies on animal, compost, green manure, crop rotation, crop residues, composting and biological pest control.

Manure is a decayed plant and animal products which have been carefully prepared to supply nutrients to plants. According to Chris and Shafigur (2016), there are three major types of manure; green, compost and animal manure. Green manure involves the process of burying or ploughing fresh growing plants in their vegetative stage into the soil. The crops suited for green manure include among others, mucuna, sun hemp, *centrosema, calapogonium, pueraria* and grasses. Compost manure is a biological process in which aerobic microorganisms decay organic materials such as manure and

bedding into a soil-like substance. Good composting requires a mix of ingredients that allow the microbial population to consume Carbon and Nitrogen. Frank (2015) stated that, a carbon to nitrogen ratio of 25-30:1 is ideal while a ratio of 20 - 40:1 is acceptable. Moisture content also must fall into a certain range. The ideal range falls between 50 - 60% with 40 - 65% being reasonable, most well bedded compost manure pack falls into acceptable range for both carbon to nitrogen ratio and moisture content.

Animal manure is the combination of animal faeces or dungs, urine and plant products used as beddings for the animals. The animal and plant products are allowed to decompose fully into manure. The faeces of poultry, goat, sheep, cattle, pigs and rabbits are essential for farmyard preparation. The period of decomposition varies with the type of animal dung used, before applying the manure; it must be allowed to decompose fully to avoid burning the roots of the crop. Animal manure represents universal fertilizer and source of humus, micro and macro nutritious elements with useful micro-organisms which directly and positively influence chemical, physical and biological soil characteristics (Kostic, *et al*., 2020).

Crop rotation is the scientific process by which crops are planted on a piece of land in an orderly sequence. Crop rotation is planned in such a way to restore nutrients removed from the soil, and deep-rooted crops like yam should be followed by shallow-rooted nitrogen-taking crops like maize and should also be followed by nitrogen-fixing crops like groundnut, a short period of fallow must be introduced into the rotation, crop rotation helps to suppress weeds and nutrients to the soil. Crop rotation is changing the type of crops grown in the field each season or each year (International Institute of Rural Reconstruction (IIRR), 2005). Crop residues can cushion the effect of excessive depletion of soil nutrient.

Crop residues are parts of the plants left in the field after crops have been harvested and thrashed or left after pastures are grazed, these materials are important natural resources used to replenish nutrients in farmlands (Kumar & Goh, 2000). Farmers using composting process can also convert crop residues to manure for use. Composting places a major import on crop growth and yields, to start compost production, farmers will need enough plant materials and animal manure. Farmers should start producing plant materials on the farm by first growing leguminous plants that build a lot of bio-production, if this proves appropriate and to get familiar with the process of making compost, farmers should be instructed by an experienced person. Proper compost production requires some knowledge, experience and additional labour in biological pest control. Biological pest control is a natural phenomenon of plant and animal regulators by their natural enemies. Pest, insects and mite control the major natural enemies are other insects known as entomophagous or micro-organisms, fungi, bacteria and viruses. The population density of one group depends on the others density. Biological pest control is economically viable of low environmental contamination and do not present risks for human health or for domestic animals (Sampaio, *et al*., 2020).

Corona Virus Disease 2019 (COVID-19) is an RNA virus, with a typical crown-like appearance under an electron microscope due to the presence of glycoprotein spikes on its envelope (Perlman & Nethland, 2019). In November 2019, an outbreak of coronaviruses (CoVs) with Severe Acute Respiratory Syndrome (SARS)-CoV started in the Chinese province of Guangdong and in September 2012 the Middle East Respiratory Syndrome (MERS)-CoV appeared (Lu, et al., 2020). The first confirmed case of COVID-19 outside China was diagnosed on 13th January 2020 in Bankok-Thailand (World Health Organisation on Coronavirus Disease, WHO COVID, 2019). On the 2nd of March 2020, 67 territories outside mainland China had reported 8565 confirmed cases of COVID-19 with 132 deaths, as well as significant community transmission occurring in several countries worldwide, including Iran and Italy and it was declared a

global pandemic by the World Health Organization (WHO) on the 11th of March 2020 (Hsu, *et al.*, 2020). Main COVID-19 associated symptoms according to Di Gennaro, et al., (2020) include: fever, cough, dyspnea, headache, sore throat, rhinorrhea, and the main COVID-19 preventive measures include among others: to use face masks, to cover coughs and sneezes, to wash hands regularly.

Farmers can use the above preventive measures of Covid-19 in organic farming for improved food security. Farmers can use biological pest control against environmental contamination, risk for human and domestic animals. A farmer, as used in this study, refers to anybody who is engaged in organic farming practices like animal manure, compost manure, green manure, crop rotation, crop residues, composting and biological pest control. Farmers need to be abreast of all the organic farming systems for improved food security. Food security is a standard nomenclature that refers to availability and accessibility of safe food by every individual in a community, state or nation for healthy living (Ndomi, 2018). Nigerians at all-time should have access to sufficient, safe, nutritious food through organic farming, hence the study.

Purpose of the Study

The purpose of this study was to identify organic farming skills needed by farmers for improved food security in Benue State, Nigeria. Specifically, the study sought to identify organic farming skills needed by farmers in:

i. manuring;
ii. crop rotation;
iii. crop residues;
iv. composting; and
v. biological pest control.

Research Questions

1. What are the organic farming skills needed by farmers in manuring?
2. What are the organic farming skills needed by farmers in crop rotation?
3. What are the organic farming skills needed by farmers in crop residues?
4. What are the organic farming skills needed by farmers in composting?
5. What are the organic farming skills needed by farmers in biological pest control?

Hypotheses

The following hypotheses were formulated for the study and tested at 0.05level of significance.

1. The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in manuring.
2. The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in crop rotation.
3. The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in crop residue.
4. The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in composting.
5. The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in biological pest control.

Methodology

Descriptive research design using survey method was adopted for this study. Survey research method is a plan, structure and strategy that an investigator adopts in order to obtain solution to research problems using questionnaire in collecting, analyzing and interpreting data. The design is suitable because the study made use of questionnaire developed from literature to collect data from the respondents. The area of the study was Benue State; the population for the study was 291 comprising of 268 Farmers and 23 Agricultural Extension Agents. The entire population was used for the study because the size was small and manageable to handle by the researchers. Hence, there was no

sampling. The instrument for data collection was 58-item questionnaire titled: *Organic Farming Skills Needed by Farmers Questionnaire* (OFSNFQ). The questionnaire was developed from literature by the researchers. It had needed and performance categories filled by the extension agents and farmers respectively. The instrument was structured in a 4 point response option of Highly Needed, Needed, Slightly and Not Needed for need category and high performance, average performance, slight performance and no performance with corresponding values of 4, 3, 2 and 1. Three experts, one from the Department of Educational Foundation and General Studies (EFOGENS)-Test and Measurement, one from the Department of Crop production and one from the Department of Agricultural Extension subjected the instrument to face and content validity all from Joseph Sarwuan Tarka University, Makurdi, Nigeria. Their comments, corrections and suggestions were utilized to improve on the initial copy of the questionnaire to produce the final copies. Cronbach-Alpha reliability method was adopted to determine the internal consistency of the questionnaire items. A cronbach-alpha coefficient of 0.88 was obtained. Two hundred and ninety-one copies of questionnaire were administered to the respondents, and two hundred and eighty-eight copies were retrieved and analyzed (98% retrieval). Need index as developed by Borich (1980) was used for answering the research questions, while t-test statistic was used to test the hypotheses at 0.05 level of significance.

The performance mean was represented with Xp, while the expected or needed mean was represented with Xn. The performance gap (PG) was obtained by subtracting the Xp from Xn. (PG= Xn-Xp). This could yield zero, negative or positive result. A zero-result means that the extent to which the item is performed is same as the extent to which they are expected or needed which shows that no improvement is needed. A negative result means that the extent to which the item is performed is higher than they are expected or needed, showing that no improvement is needed while a positive result shows that the extent to which the item is performed is below the extent to which they are expected or needed, implying that improvement is needed in such item. The hypotheses of no significant difference were upheld for any item whose t-calculated value was less than the Table value of 1.96 at 0.05 level of significance.

Results

The results for the study were obtained from the research questions answered and hypotheses tested through data collected and analyzed.

Research Question 1

What are the organic farming skills needed by farmers in manure preparation and application?

Hypotheses 1

The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in manuring.

Table 1

Organic Manuring Needs and t-test Analysis of the Responses of Farmers and Agricultural Extension Agents in Manuring (N=288)

S/N	Animal, Compost and Green Manure	Xn	Xp	PG	Sig.	Rmk
	Animal Manure; Ability to:					
1.	Source for animal waste such as dead animals, wasted feed among others	3.45	2.87	0.58	.86	N,NS
2.	Collect the waste from the point of origin	3.36	2.81	0.55	.85	N,NS
3.	Store the collected animal waste	3.34	2.5	0.85	1.59	N,NS
4.	Treat the collected waste physically, biological and chemically to reduce pollution	3.50	2.53	0.97	1.58	N,NS
5.	Separate the solid waste from the liquid waste	3.49	2.71	0.78	.55	N,NS
6.	Transfer the animal waste to the storage site	3.18	2.69	0.49	.25	N,NS
7.	Transfer to treatment facility	3.49	2.71	0.78	.59	N,NS
8.	Transfer to the utilization site	3.18	2.69	0.49	.33	N,NS
9.	Transfer as a solid, liquid or slurry depending on the total solid concentration	3.49	2.52	0.97	.32	N,NS
10.	Recycle the treated animal waste to the environment as animal manure for use	3.61	2.60	1.01	.86	N,NS
	Compost and Green manure; Ability to:					
11.	Inoculate the legume seeds and cuttings	3.53	2.78	0.75	.47	N,NS
12.	Prepare seed beds	3.51	2.64	0.87	.39	N,NS
13.	Broadcast the seeds on the beds	3.23	2.68	0.55	.12	N,NS
14.	Plant the cuttings on the beds.	3.67	2.48	1.19	.46	N,NS
15.	Space appropriately	3.48	2.54	0.94	.13	N,NS
16.	Water the seed bed after planting	3.53	2.73	0.80	.47	N,NS
17.	Weed the farm regularly to reduce weed competition and insect attack.	3.45	2.87	0.58	.39	N,NS
18.	Cut the crop before flowering sets in	3.36	2.81	0.55	1.19	N,NS
19.	Allow the crops to regrow for flowering	3.34	2.50	0.84	.22	N,NS
20.	Plough in the crop distributing evenly after flowering	3.50	2.53	0.97	.42	N,NS

Key: $\bar{X}$n-mean of need category, $\bar{X}$p-mean of performance category, PG- performance gap, sig,-calculated value, N-needed, NS- not significant, df-286, t-tab-1.96

The data in Table 1 showed that the performance gap PG for all the items ranged from 0.55 to 1.19 and are all positive. This implies that all the items are the Organic manuring needs of farmers. The results also revealed that the item had t-calculated value ranged from 0.13 to 1.59; this indicates that the item had t-calculated value less than the t-critical value of 1.96. Therefore, the null hypothesis of no significant difference in the responses of organic farmers and agricultural extension agents in organic manuring in Benue state was accepted.

Research Question 2

What are the organic farming skills needed by farmers in crop rotation?

Hypotheses 2

The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in crop rotation.

Table 2

Crop Rotation Needs and t-test Analysis of the Responses of Organic Farmers and Agricultural Extension Agents (N=288)

S/N	Crop Rotation	Xn	Xp	PG	Sig.	Rmk
	Ability to:					
1.	Make list of crops to grow	3.53	2.40	1.13	.59	N,NS
2.	Group the crops into families using principles of shallow/deep rooted crops, heavy feeders, disease and pest attack resistance	3.45	2.87	0.58	.33	N,NS
3.	Sketch a map of graph papers indicating positions of each group of crops	3.36	2.41	0.95	.32	N,NS
4.	Translate the map into the field/farm maintaining the correct to each crop	3.34	2.16	1.18	.45	N,NS
5.	Label each crop with the year	3.50	2.33	1.17	.42	N,NS
6.	Plant specific crop in the mapped spaces according to translation	3.49	2.49	1.00	.32	N,NS
7.	Introduce fallow system into rotation schedule in order of sequence.	3.30	2.41	0.89	.59	N,NS
8.	Identify the benefit or problems encountered using the plan	3.49	2.89	0.60	.54	N,NS
9.	Modify the rotation schedule if need be to minimize the loss	3.61	2.90	0.71	1.64	N,NS
10.	Consider the crops pattern of neighbouring farmers to maximize the benefit of the rotation	3.43	2.58	0.85	.37	N,NS
11.	Maintain consistency of the rotation schedule for consistent result	3.51	2.91	0.60	.12	N,NS
12.	Keep record of crop type, yield, weather, soil amendments, chemicals and cost of production for calculation and observation of gain and loss.	3.23	2.57	0.66	.47	N,NS

Key: $\bar{X}$n-mean of need category, $\bar{X}$p-mean of performance category, PG- performance gap, sig,-calculated value, N-needed, NS- not significant, df-286, t-tab-1.96

The data in Table 2 showed that the performance gap PG for all the items ranged from 0.58 to 1.18 and are all positive. This implies that all the items are the Organic manuring needs of farmers. The results also revealed that the item had t-calculated value ranged from 0.13 to 1.64; this indicates that the item had t-calculated value less than the t-critical value of 1.96. Therefore, the null hypothesis of no significant difference in the responses of organic farmers and agricultural extension agents in organic manuring in Benue state was accepted.

Research Question 3

What are the organic farming skills needed by farmers in crop residues?

Hypotheses 3

The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in crop residues.

Table 3

Crop Residues Needs and t-test Analysis of the Responses of Farmers and Agricultural Extension Agents (N=288)

S/N	Crop Residues	Xn	Xp	PG	Sig.	Rmk
	Ability to:					
1.	Select the crop-residue type like maize cob, groundnut husk cassava stalk among others.	3.67	2.47	1.20	1.19	N,NS
2.	Collect crop residues in the field	3.64	2.63	1.01	.22	N,NS
3.	Assess the characteristics of crop residue	3.25	2.23	1.02	.42	N,NS
4.	Determine the residue-to-crop-ratio (the amount of straw to grain in cereals)	3.50	2.27	1.23	.12	N,NS
5.	Determine the percentage of the generated residues left after harvesting	3.49	2.43	1.06	.45	N,NS
6.	Estimate the amount of the residues burnt in the field	3.40	2.09	1.31	1.19	N,NS
7.	Identify the amount of residue currently used.	3.49	2.70	0.79	.22	N,NS

Key: $\overline{X}$n-mean of need category, $\overline{X}$p-mean of performance category, PG- performance gap, sig,-calculated value, N-needed, NS- not significant, df-286, t-tab-1.96

The data in Table 3 showed that the performance gap PG for all the items ranged from 0.79 to 1.23 and are all positive. This implies that all the items are the crop rotation/residues needs of farmers. The results also revealed that the item had t-calculated value ranged from 0.12 to 1.19; this indicates that the item had t-calculated value less than the t-critical value of 1.96. Therefore, the null hypothesis of no significant difference in the responses of organic farmers and agricultural extension agents in crop rotation/residue in Benue State was accepted.

Research Question 4

What are the organic farming skills needed by farmers in composting?

Hypothesis 4

The mean ratings of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in composting.

Table 4

Mean Composting Needs and t-test Analysis of the Responses of Farmers and Agricultural Extension Agents (N=288)

S/N	Composting	Xn	Xp	PG	Sig.	Rmk
	Ability to:					
1.	Collect composting materials	3.45	2.72	0.73	.47	N,NS
2.	Choose a shady location	3.36	2.44	0.92	.39	N,NS
3.	Pile up the heaps separately	3.7	2.01	1.69	.12	N,NS
4.	Collect plenty of plant materials	3.49	2.94	0.55	.46	N,NS
5.	Chop coarse material	3.61	2.87	0.74	.33	N,NS
6.	Set up the heap from bottom up: N-rich in material coarse C-rich in material twigs and branches	3.53	2.68	0.85	.32	N,NS
7.	Humidify the materials	3.48	2.96	0.52	1.64	N,NS
8.	Pile up loosely in layers	3.29	2.81	0.48	.37	N,NS
9.	Cover with earth or straw	3.39	2.47	0.92	.22	N,NS
10.	Turn the heap first after 2-3weeks second after 3months	3.54	2.52	1.02	.31	N,NS

Key: $\overline{X}$n-mean of need category, $\overline{X}$p-mean of performance category, PG- performance gap, sig,-calculated value, N-needed, NS- not significant, df-286, t-tab-1.96

The data in Table 4 showed that the performance gap PG for all the items ranged from 0.48 to 1.69 and are all positive. This implies that all the items are the Organic

manuring needs of farmers. The results also revealed that the items had t-calculated value ranged from 0.31 to 1.64; this indicates that the items had t-calculated value less than the t-critical value of 1.96. Therefore, the null hypothesis of no significant difference in the responses of organic farmers and agricultural extension agents in organic manuring in Benue state was accepted.

Research Question 5

What are the organic farming skills needed by farmers in biological pest control?

Hypothesis 5

The mean responses of farmers and agricultural extension agents do not differ significantly on organic farming skills needed in biological pest control.

Table 5

Biological Pest Control Needs and t-test Analysis of the Responses of Farmers and Agricultural Extension Agents (N=288)

S/N	Biological Pest Control	Xn	Xp	PG	Sig.	Rmk
	Biological Pest Control; Ability to:					
1.	Selection of adapted and resistant varieties	3.40	2.82	0.58	1.64	N,NS
2.	Selection of clean seeds and planting materials	3.24	2.73	0.51	.37	N,NS
3.	Use suitable cropping systems	3.51	2.69	0.82	.85	N,NS
4.	Use balanced nutrient management	3.59	2.60	0.99	1.59	N,NS
5.	Use of organic matter	3.57	2.73	0.84	.86	N,NS
6.	Apply suitable soil conservation methods	3.42	2.99	0.43	.45	N,NS
7.	Use good water management	3.33	2.77	0.56	1.28	N,NS
8.	Conserve and promote natural enemies	3.63	2.66	0.97	1.64	N,NS
9.	Select optimum planting time and spacing	3.43	2.84	0.59	.37	N,NS

Key: $\bar{X}$n-mean of need category, $\bar{X}$p-mean of performance category, PG- performance gap, sig,-calculated value, N-needed, NS- not significant, df-286, t-tab-1.96

The data in Table 5 showed that the performance gap PG for all the items ranged from 0.43 to 1.69 and are all positive. This implies that all the items are the composting/pest control needs of farmers. The results also revealed that the item had t-calculated value ranged from 0.37 to 1.64; this indicates that the item had t-calculated value less than the t-critical value of 1.96. Therefore, the null hypothesis of no significant difference in the responses of organic farmers and agricultural extension agents in composting/pest control in Benue state was accepted.

Discussion of Findings

Research question 1 and hypothesis 1 were on manuring in organic farming skills needed by farmers for improved food security in Benue state. The findings revealed that sourcing of animal waste such as dead animals, wasted feed, collect the waste from the point of origin, store the collected animal waste, treating the collected waste physically, biological and chemically to reduce pollution, separating the solid waste from the liquid waste, transferring the animal waste to the storage site, transferring to treatment facility, transferring to the utilization site, transfer as a solid, liquid or slurrying depending on the total solid concentration, and recycling the treated animal waste to the environment as animal manure for use, inoculating the legume seeds and cuttings, preparing seed beds, broadcasting the seeds on the beds, planting the cuttings on the beds, spacing appropriately, watering the seed bed after planting, weeding the farm regularly to reduce weed competition and insect attack, cutting the crop before flowering sets in, allow the crops to regrow for flowering and ploughing in the crop distributing evenly after flowering were the skills items needed in manuring. Findings on the test of hypothesis also revealed no significant difference in the mean ratings of farmers and extension agents on manuring in organic farming skills needed by farmers for

improved food security in Benue state, Nigeria.

The findings of this study were in consonance with the findings of Sangakkara, et al., (2008) in a study on green manuring for tropical organic cropping who said that *sesbania* and *crotalaria* had highest N contents and the lowest C:N ratios, which are important in green manures. The inclusion of twigs, which is done by most tropical farms in *ex situ* mulching, reduced N content and increased the C:N ratios of *gliricida* and *tithonia*. In addition, *tithonia* had the lowest N content and hence, the highest C:N ratios thus indicating its inability to provide N to plants in organic systems, although it is known to provide P to crops. Singh, et al., (2018) in a study on green manuring: concept and practices reports that ploughing the crop back in the soil during vegetative growth period (40-50days) before flowering, ploughing green manure crop sown in mixed crop is buried at the appropriate time, braking green leaves and tender twigs, spread in the field and burring by ploughing which rots when there is moisture in the field were steps in manuring in organic farming practices. Anton and Francis (2022) outlined the following as manuring practices, green manure crop should be grown in irrigated area or where annual rainfall is more than 30 inches, after green manuring subsequent crops should be sown in well decomposed crops, in irrigated areas, the best stage at which the crop should be incorporated in the soil as a green manure is when it reaches the flowering stage, select quick growing green manure preferably from the legume family that have deep root system.

Research question 2 and hypothesis 2 were on crop rotation in organic farming skills needed by farmers for improved food security in Benue state. The findings showed that making list of crops to grow, grouping the crops into families using principles of shallow/deep rooted crops, heavy feeders, disease and pest attack resistance, sketching a map of graph papers indicating positions of each group of crops, translate the map into the field/farm maintaining the correct to each crop, labeling each crop with the year, planting specific crop in the mapped spaces according to translation, introducing fallow system into rotation schedule in order of sequence, identifying the benefit or problems encountered using the plan, modifying the rotation schedule if need be to minimize the loss, considering the crops pattern of neighbouring farmers to maximize the benefit of the rotation, maintaining consistency of the rotation schedule for consistent result, and keeping records of crop type, yield, weather, soil amendments, chemicals and cost of production for calculation and observing gain and loss were the skills items needed in crop rotation were the skills items needed in crop rotation. Findings on the test of hypothesis also revealed no significant difference in the mean ratings of farmers and extension agents on crop rotation in organic farming skills needed by farmers for improved food security in Benue state, Nigeria.

The findings of this study were similar to the findings of Charles and Sue (2009) who identified sketching a map of graph papers indicating positions of each group of crops, translate the map into the field/farm maintaining the correct to each crop as crop rotation practices in organic farming. Also, Triberti, et al., (2016) in a study on long-term effects of crop rotation, manure fertilization on carbon sequestration and soil fertility outlined introducing fallow system into rotation schedule in order of sequence, identifying the benefit or problems encountered using the plan as crop rotation practices in organic farming.

Research question 3 and hypothesis 3 were on crop residues in organic farming skills needed by farmers for improved food security in Benue state. The findings outlined selecting the crop-residue type like maize cob, groundnut husk cassava stalk among others, collecting crop residues in the field, assessing the characteristics of crop residue, determining the residue-to-crop-ratio (the amount of straw to grain in cereals), determining the percentage of the generated residues left after harvesting, and estimating the amount of the residues burnt in the field,

and identifying the amount of residue currently used were the skills items needed in crop residues. Findings on the test of hypothesis also revealed no significant difference in the mean ratings of farmers and extension agents on crop residues in organic farming skills needed by farmers for improved food security in Benue state, Nigeria. The findings of this study were also in agreement with the findings of Bhattacharyya and Dhananjay (2018) on crop residue management and greenhouse gases emissions in tropical rice lands, that crop residues, as lignocellulosic materials, have a potential source of renewable energy. The authors went further that, the synthesis of biofuel from crop residues and the mixing of biofuels with conventional fuels could save the exploitation of fossil fuel, which thereby reduces greenhouse emissions and helps to mitigate climate change.

Research question 4 and hypothesis 4 were on composting in organic farming skills needed by farmers for improved food security in Benue state. The finding listed collecting composting materials, choosing a shady location, piling up the heaps separately, collecting plenty of plant materials, chopping coarse material, setting up the heap from bottom up: N-rich in material coarse C-rich in material twigs and branches, humidifying the materials, piling up loosely in layers, covering with earth or straw, and turn the heap first after 2-3weeks second after 3 months. Findings on the test of hypothesis also revealed no significant difference in the mean ratings of farmers and extension agents on composting in organic farming skills needed by farmers for improved food security in Benue state, Nigeria.

The findings agree with the findings of Eze and Asogwa (2013) who found out that lecturers of agricultural education in universities in Southeast, Nigeria were deficient in 48-technical skills items (11 in crop rotation, 8 in green manuring, 21 in composting and 8 in biological pests and disease control) and indicates that the lecturers needed capacity building in 48 technical skill items identified by this study for effective delivery of organic farming to students in universities Southeast, Nigeria.

Research question 5 and hypothesis 5 were on biological pest control in organic farming skills needed by farmers for improved food security in Benue state. The findings revealed selection of adapted and resistant varieties, use suitable cropping systems, use balanced nutrient management, use of organic matter, apply suitable soil conservation methods, use good water management, conserve and promote natural enemies and select optimum planting time and spacing. Findings on the test of hypothesis also revealed no significant difference in the mean ratings of farmers and extension agents on biological pest control in organic farming skills needed by farmers for improved food security in Benue State, Nigeria.

The findings are similar to a study by Prakriti (2021) who outlined habitat management and manipulation like multiple cropping, inter cropping, trap cropping, strip harvesting, selective retention of weeds, and conservation of wild plants at field margins, providing food, reducing mechanical injury, eliminating dust, reducing deleterious effect, planting ground cover, planting resistant crop varieties, use of pesticides that favour natural enemies, choosing time of application of pesticides that allows minimum detrimental effect against natural enemies, monitoring natural enemy density, understanding their impact on pest population where the strategies used for biological pest control. The study is also in consonance with Food and Agricultural Organization (FAO, 2019) who outlined use of natural enemies for pest control, use of parasites, use of predators, control conservation augmentation biological control, conservation biological control and Classical Biological Control (CBC), selecting properties of fine organic matter like humus, selecting organic matter and soil processes, collection of organic material, stacking of the organic materials in a heap, add compost to sandy soils to increase the water retention capacity, apply superfluous materials, apply superfluous or waste materials, mix different

compost materials in sizes of heaps from 1m x 1m to 3m x 3m for constant temperature within the heap, compost through heating phase, a cooling down phase and a maturation phase as steps in biological pest control.

Conclusion

From this study, organic farmers needed 20 skills in animal, compost and green manure, 12 skills in crop rotation, 7 skills in crop residues, 10skills in composting and 9 skills in biological pest control in organic farming for improved food security.

Recommendations

1. The identified organic farming practices should be used by agricultural extension agents to retrain organic farmers for improved food security.
2. The identified organic farming practices could be replicated for the production of other agricultural practices.
3. The identified organic farming practices should be utilized by skill acquisition centres to teach other people who are interested in going into organic farming.

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EVALUATION OF THE ATTITUDE OF AGRICULTURE STUDENTS IN TERTIARY INSTITUTIONS TOWARD SELF-EMPLOYMENT AND ENTREPRENEURSHIP IN DELTA STATE

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Abstract
This study investigated the attitude of agriculture students in tertiary institutions toward self-employment and entrepreneurship in Delta State. The study adopted the descriptive survey research design. The population of the study comprised all agriculture undergraduate students of four state universities in Delta State. Purposive and Disproportionate Stratified random sampling techniques were used. The sampling frame was made up of 513 students drawn from strata of three and four-level students. Fifty (50) percent of the sampling was randomly selected to give a sample size of two hundred and fifty-seven (257). Data were collected by the use of a structured questionnaire of 40 items. Mean, Standard deviation, and t-tests were used in data analysis. The findings amongst others show that agriculture undergraduate students have positive attitudes toward self-employment and entrepreneurship in agriculture; the respondents have a high level of preparedness/intention toward entrepreneurship, and the students also identified their major felt needs for entering into self-employment in agriculture upon graduation. The findings of the null hypotheses tested indicated that there is no significant difference in the mean responses of male and female agriculture undergraduate students on attitude toward self-employment and entrepreneurship in agriculture and entrepreneurship opportunities in Delta State. Therefore, it was recommended amongst others that the state government should provide tertiary institutions with adequate infrastructure, modern agricultural and entrepreneurial equipment/facilities, build entrepreneurship centers, and quality personnel to aid the transmission of entrepreneurial skills to students.

Keywords: Attitude, agriculture, students, tertiary institution, self-employment, entrepreneurship.

Introduction

Entrepreneurship is the process of starting and operating a new business to make a profit. Entrepreneurship is an individual's ability to turn ideas into action (European Commission, 2020). The field of entrepreneurship is considered essential for the economy, and many researchers around the world have studied it from diverse perspectives. The outcomes of this research are yet consensual. Today, as noted by Deyi, *et al.* (2020), entrepreneurship has gained recognition and consensus due to the increasing pressure of unemployment and the need for sustainable economic development. Therefore, they suggested that there is a need for more researchers to examine this field, especially in the case of the agricultural sector, by incorporating sustainability value creation practices and the efforts of current entrepreneurs toward a said goal (Deyi, *et al*., 2020).

Entrepreneurship therefore can be defined as the willingness and ability of an individual or group of people to search for investment opportunities, establish, and run a business unit successfully (UNESCO, 2010). Entrepreneurship involves identifying business opportunities, mobilizing resources, and taking innovative and calculated risks to turn an idea into a viable and sustainable business venture. Similarly, Adewale (2015) stated that entrepreneurship revolves around the realization of existing opportunities in combination with the decision to commercialize them by starting a new firm. In other words, Entrepreneurship is an academic discipline, although it is still considered relatively new. Its origin can be traced back to the 70th century when

economist Richard Cantillion coined the term "entrepreneur" (Richard, 1755).

Entrepreneurship is recognized as an important source of job growth and economic development in a country. Although the rate of growth for entrepreneurship varies from country to country, the fact is that it has a clear and positive impact on economic growth (Amran, *et al*., 2013). Solomon cited in Adewale (2015) remarked that the essence of entrepreneurship is the ability to envision and chart a course for a new business venture by combining information from the functional disciplines and from the external environment in the context of the extraordinary uncertainty and ambiguity that faces a new business venture. It manifests itself in creative strategies, innovative tactics, uncanny perception of trends in the market, and courageous leadership.

Entrepreneurship in agriculture is the formation of a new economic organization with the intention of growth under risk and uncertainty in agriculture. According to Ikeoji (2018) entrepreneurship within agriculture entails the personal willingness and ability to manipulate human and material resources in agriculture to yield an anticipated outcome. Additionally, it involves the combination of the attributes of agricultural know-how and entrepreneurship in the production of agricultural produce to generate wealth and employment in a society.

On the other hand, self-employment intention in the agriculture sector has gained recognition over the years and is well appreciated among higher education students. Self-employment means working for oneself and becoming one's own boss. It involves running and managing a business venture by oneself. Self-employment is needed in today's world due to changing work preferences, economic dynamics, technological advancements, and the desire for more personal and professional autonomy. It provides a pathway for individuals to shape their careers in alignment with their skills, passions, and lifestyle preferences (Ishwar, 2022). Self-employed people are mostly found in the agricultural sector (Dlamini, 2022). However, the felt needs of undergraduate students for entry into self-employment in agriculture are the specific desires, requirements, and challenges that the students perceive as essential for starting and succeeding in their agricultural businesses. It therefore means that for one to be self-employed, there are certain motivational needs they may possess or acquire before starting a business.

In Nigeria, attention has been given lately to the role self-employment and entrepreneurship play in social and economic development. The importance of self-employment and entrepreneurship to economic and social development is widely debated and acknowledged as the source of employment, income generation, and wealth creation since corporate employment has been faced with the growing unemployment of higher education graduates, whom the modern sector could not absorb. The presidency gave a mandate that all students in tertiary institutions in Nigeria irrespective of their disciplines, to study entrepreneurship as a unit course before they obtain their degrees and diplomas. In other to create a critical mass of graduates who are better prepared for employment in both public and private sectors, as well as creators of knowledge-based enterprises (UNESCO, 2010). "Entrepreneurship is increasingly understood as a set of competencies required for many professions to be integrated into education and training, even in such seemingly distant areas as, public administration, management, sport, agriculture, or tourism" (p.186). However, this tendency towards an understanding of entrepreneurship in a broader way and, at the same time, a growing need for the inclusion of sustainability issues in education, should consequently lead to the expansion of the concept of the entrepreneurial university (Klucznik-2020).

Arnaut (2020) remarked that universities as centers for knowledge and diffusion can be leveraged to generate future economic growth. However, in developing

countries, universities need to operate under policies that encourage entrepreneurship and innovation. However, an understanding of entrepreneurship in a broader way, and the acknowledgment that most of the curricula in Nigeria's educational system at the tertiary level, in particular, are not geared toward effective national and economic development, necessitated the inclusion of entrepreneurship education in the curriculum of tertiary institutions (Egunsola, *et al.*, 2012). This is made possible by the fact that entrepreneurship has been recognized and accepted as a solution vector to solve the unemployment problem. Therefore, the role of academic institutions in stimulating, and contributing to, the development of the modern knowledge-based economy has become widely accepted in line with the Vision for tertiary education which is "To advance Nigeria's economic growth, development, and global competitiveness through the provision of relevant, high-quality and accessible education in all the higher education Institutions" (Education, 2013).

Entrepreneurship education is an academic learning program that prepares (students) for their future careers. Arnaut, (2020) stated that entrepreneurship education is crucial to help young people develop entrepreneurial skills, attitudes, and behaviors, as well as to embrace a career option. According to Premand, *et al.* (2016), entrepreneurship education has the potential to enable youth to gain skills and create jobs. Many recent studies have recognized that entrepreneurship is not sufficiently addressed by training and educational establishments in Nigeria, Delta state inclusive (Ijioma, Ojo, and Ohonba, cited in Kennedy 2011). Since the education curriculum offered in selected subjects is too theoretical and not adequately in line with the labor market (Kennedy 2011). Hence, Phiri, and Chasay (2023) Suggest that policymakers, university management, and curriculum developers should promote entrepreneurship education and focus more on its design for effective results.

The intention to participate in entrepreneurship encompasses attitudes towards the pursuit of entrepreneurship as a career option, and a willingness to act (Ajzen, 1991). The vital steps of developing entrepreneurship and self-employment among students are influencing their attitude into a category (Kandra, 2023). According to Esfandiar, et al (2019), attitude is a "psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour." The more positive the attitude toward self-employment and entrepreneurship is, the more students will be encouraged to venture into business. Attitudes are important because they influence how we behave, especially growing youths, affecting the choices they make and how healthy their habits are each day. Ismail, (2015) stated that "Attitudes and intentions are precursors of entrepreneurial action. An understanding of the attitudes and those factors that may impact them is a critical step in promoting greater self-employment/ entrepreneurship initiatives.

To direct youths' interest to be involved in entrepreneurship careers, especially in the agricultural sector is essential. It is the best strategy to reduce unemployment among tertiary institution graduates in Nigeria since the main objective of entrepreneurship education is to promote the practical application of knowledge and saleable skills development for self-employment and the promotion of an environment for income generation activities (Egbule, 2018). However, it is difficult to generalize the attitude of agriculture students in tertiary institutions towards self-employment and entrepreneurship as it may vary based on various factors such as their cultural background, personal experience, education, and exposure to entrepreneurship. Understanding student's attitudes regarding self-employment and entrepreneurship will be important. The study evaluates the attitude of agriculture students in tertiary institutions toward self-employment and entrepreneurship in Delta State.

From the onset of the employment crisis and the increasing unemployment of graduates in Nigeria and Delta State in particular, there has been a renewed interest among present and past governments, policy-makers, and curriculum planners across the nation to stimulate self-employment and entrepreneurship intention among tertiary institutions students, through the introduction of entrepreneurship course and programs as an alternative to unemployment and the shortage public employment. Despite this considerable interest among policy-makers and the unique potential of the agricultural sector in fostering economic development in Delta State and curbing youth unemployment, there is little evidence available concerning the number and quality of jobs that young people create for themselves or others within the agricultural sector of the Nigeria economy when they embark on entrepreneurial activities. Some perceived fundamental problems are the prevailing mindset, social misconception, and perception of agriculture as a "low-status" profession that influences the attitude of agriculture students. Secondly, the Lack of enthusiasm and motivation among agriculture students to venture into self-employment and entrepreneurship poses a significant challenge to the growth and development of the agricultural sector in the state. The inappropriate training and practical skills development in entrepreneurship and business management is another key contributor to the problem.

However, these discrepancies raise critical questions about the impact of the current curriculum, the adequacy of support systems, and the overall efficacy of existing strategies in fostering a positive attitude and inclination toward self-employment and entrepreneurship among agriculture students in Delta State. However, the attitude of agriculture students in tertiary institutions toward self-employment and entrepreneurship in Delta State is a critical issue that needs to be addressed, since Agriculture plays a vital role in the economic development and food security of any nation, and Delta State is no exception. Therefore, to address these challenges, this study was set to evaluate the attitude of agriculture students in tertiary institutions toward self-employment/entrepreneurship in Delta State.

Purpose of the Study

Specifically, the study sought to:

i. evaluate the attitude of undergraduate Agriculture students of Tertiary Institutions towards self-employment in the Agricultural industry in Delta State;
ii. evaluate the undergraduate's student's attitudes towards entrepreneurship in agriculture in Delta State;
iii. examine the felt needs of agriculture undergraduate students for entry into self-employment upon graduation; and
iv. assess the level of undergraduate preparedness/ intentions towards entrepreneurship in agriculture in Delta State.

Research Questions

This study was guided by the following research questions:

1. What is the attitude of undergraduate Agriculture students of Tertiary Institutions towards self-employment in the Agricultural industry in Delta State?
2. What are the undergraduate's student's attitudes towards entrepreneurship in agriculture in Delta State?
3. What are the felt needs of undergraduate students of Tertiary Institutions for entry into self-employment upon graduation?
4. What is the level of undergraduate students' preparedness/ intentions towards entrepreneurship in Delta State?

Hypotheses

The following null hypotheses will be tested in this study.

Ho_1: There is no significant difference in the attitudes of male and female agriculture students in tertiary institutions towards self-employment in agriculture in Delta State

Ho_2: There is no significant difference in the mean score between male and female

undergraduate students toward entrepreneurship in agriculture in Delta State.

Methodology

This study was carried out in Delta State, the south-south region of Nigeria. It adopted the descriptive survey research design. The population of the study comprises all agriculture undergraduate students of the four State Universities in Delta State. However, the sampling frame was made up of 513 students drawn from strata of three and four-level students purposively selected. With the use of Disproportionate Stratified random sampling techniques, fifty (50) percent of the sampling was randomly selected to give a sample size of two hundred and fifty-seven (257). The study was guided by four specific objectives and four research questions. Also, two research hypotheses were formulated and tested at 0.05 alpha level with 242 degrees of freedom. Data were collected through the use of a structured questionnaire of 40 – items. The instrument is structured on a four-point rating scale of Strongly Agree, Agree, Disagree, and Strongly Disagree, respectively. The instrument was generated by the researcher under the guidance of the supervisor and was validated by three subject matter experts from the Department of Vocational Agricultural Education and the Faculty of Agriculture. The reliability of the instrument was done with the use of the Cronbach Alpha method, and a coefficient index of 0.90 was obtained. The research questions were analyzed with mean and Standard deviation, while the hypotheses were analyzed by independent t-test at 0.05 alpha level at 242.

Results

Research Question 1

What is the attitude of undergraduate Agriculture students of tertiary institutions towards self-employment in the Agricultural industry in Delta State?

Table 1

Mean and Standard Deviation of the Attitude of Undergraduate Agricultural Students in Tertiary Institutions Toward Self-Employment in the Agriculture Industry in Delta State (n = 244)

S/N	Items	Mean ($\bar{x}$)	SD	Decision
1.	I am motivated to explore self-employment opportunities in the agricultural industry upon graduation	3.49	0.67	Agree
2.	Starting and managing my own agricultural business is something I am enthusiastic about	3.45	0.67	Agree
3.	Starting my own agriculture-related business is an appealing option	3.31	0.76	Agree
4.	I am open to taking risks associated with self-employment in the agricultural sector	3.26	0.77	Agree
5.	Self-employment in agriculture is a way to make a positive impact on society.	3.60	0.63	Agree
6.	I am confident in my ability to acquire the necessary skills for successful self-employment in agriculture	3.46	0.64	Agree
7.	Self-employment in the agricultural industry is a viable and attractive career option for me.	3.39	0.71	Agree
8.	I am equipped with the necessary knowledge and skills to pursue self-employment in the agriculture sector	3.11	0.76	Agree
9.	Self-employment in agriculture aligns with my long-term career goals.	3.22	0.73	Agree
10.	I am confident in my ability to overcome challenges associated with starting and managing an agricultural business.	3.29	0.69	Agree

Source: Field Work (2024)

The data presented in Table 1 indicates that all the items had a mean range of 3.11-3.60; the values were above the benchmark of 2.50. These values showed that the respondents agreed with all the items on the attitude of undergraduate agriculture students of tertiary institutions towards self-employment in the agricultural industry. The Standard deviation of the statement items ranged from 0.63 - 0.77, which is an indication that the respondent's responses were closer and not also far from the mean. This indicates a highly positive attitude among undergraduate agriculture students of tertiary institutions towards self-employment in the agricultural industry in Delta State.

Research Question 2

What are the undergraduate students' attitudes towards entrepreneurship in agriculture in Delta State?

Table 2

Mean and Standard Deviation on the Undergraduate Student's Attitudes Towards Entrepreneurship in Agriculture in Delta State (n=244)

S/N	Items	Mean ($\bar{x}$)	SD	Decision
1.	I have taken an entrepreneurship course(s) or training	3.22	0.79	Agree
2.	I consider entrepreneurship as being as important if not more important than any other subject	3.28	0.65	Agree
3.	I consider entrepreneurship a desirable career option	3.35	0.67	Agree
4.	I am happy to have learned about entrepreneurship education	3.34	0.66	Agree
5.	I have the confidence to start and manage a business	3.37	0.69	Agree
6.	Entrepreneurship offers better opportunities for personal growth compared to traditional employment.	3.47	0.61	Agree
7.	I enjoyed entrepreneurship education lessons	3.36	0.65	Agree
8.	Entrepreneurship education prepared me to make innovative and informed decisions about career choices	3.35	0.66	Agree
9.	I feel that the education system should provide more support and resources for aspiring entrepreneurs	3.56	0.65	Agree
10.	I want to work for myself after completing school	3.58	0.61	Agree

Sources: Field Work (2024)

The data presented in Table 2 showed that respondents agreed with all the items on undergraduate's student's attitudes toward entrepreneurship in agriculture since their mean scores which ranged from 3.22 to 3.58 are greater than the cut-off point of 2.50. The Standard deviation item statement ranged from 0.61 – 0.79 indicating that they are close to one another and not far from the mean. This indicates that they have a highly positive attitude towards entrepreneurship in agriculture in Delta State.

Research Question 3

What are the felt needs of undergraduate students of tertiary institutions for entry into self-employment upon graduation?

Table 3

Mean and Standard Deviation on the Felt Needs of Undergraduate Students of Tertiary Institutions for Entry into Self-Empowerment Upon Graduation (n=244)

S/N	Items	Mean ($\bar{x}$)	SD	Decision
1.	Access to sufficient resources and support networks for starting my agricultural venture	3.13	0.84	Agree
2.	I feel the need to have a supportive family and friends	3.33	0.64	Agree
3.	Mentorship programs would significantly contribute to my success in starting and managing a business	3.31	0.58	Agree
4.	Ability to secure funding or resources to initiate a self-employment venture	3.33	0.74	Agree
5.	The constant power supply is a felt need in self-employment.	3.36	0.63	Agree
6.	Need to recognize adequate business opportunities	3.36	0.61	Agree
7.	I feel that a collaborative platform for networking with experienced entrepreneurs and industry professionals would be beneficial for my self-employment goals	3.37	0.65	Agree
8.	Knowledge of market trends and customer behavior is needed	3.37	0.64	Agree
9.	I feel the need to acquire business and marketing skills to pursue self-employment in agriculture.	3.42	0.59	Agree
10.	Need to turn practical knowledge into a viable and profitable self-employment business.	3.45	0.63	Agree

Sources: Field Work (2024)

The data presented in Table 3 shows that respondents agreed to all the itemized statements on the felt needs of undergraduate students of tertiary institutions for entry into self-employment upon graduation mean score of 3.13 – 3.45 indicating that they are above the benchmark of 2.50. The Standard deviation of the respondent's responses which ranged from 0.58 – 0.84 showed that the respondents were close to one another and the mean in their responses.

Research Question 4

What is the level of undergraduate preparedness/intentions towards entrepreneurship in agriculture in Delta State?

Table 4

Mean and Standard Deviation on the Level of Undergraduate Preparedness/Intentions Towards Entrepreneurship in Agriculture in Delta State (n=244)

S/N	Items	Mean ($\bar{x}$)	SD	Decision
1.	I have a strong intention to start my own business after completing my study	3.59	0.62	Agree
2.	I am well prepared to become an entrepreneur rather than to be an employee in a company	3.27	0.85	Agree
3.	I would rather be my business boss than work for another individual at organizations	3.42	0.72	Agree
4.	I am determined to create a business venture in the future	3.56	0.59	Agree
5.	I have sufficient knowledge and skills to start an agriculture business	3.11	0.77	Agree
6.	I am confident in my abilities to manage the challenges of running an agriculture-based enterprise	3.15	0.72	Agree
7.	I am motivated to pursue entrepreneurship in the field of agriculture	3.30	0.67	Agree
8.	I have a clear plan for starting my own agriculture-related business after graduation	3.16	0.80	Agree
9.	I have access to capital to start my own business	3.53	0.96	Agree
10.	I have been delighted to face the challenges of creating a new business	3.20	0.75	Agree

Sources: Field Work (2024)

The data presented in Table 4 shows that the respondents agreed to all the items on the level of preparedness/intentions towards entrepreneurship in agriculture in Delta State means a score ranging from 3.11 – 3.59, which is greater than the cut-off point of 2.50. The Standard deviation of the respondents ranged from 0.59 – 0.96, these values showed that the respondents were close to the mean and one another in their responses. This indicates that the respondents have a high positive level of preparedness/intentions towards entrepreneurship in agriculture in Delta State.

Hypothesis 1

There is no significant difference in the mean responses of male and female agriculture students in tertiary institutions on attitude towards self-employment in agriculture in Delta State.

Table 5

Summary of Independent t-test Analysis of the Difference in the Mean Responses on the Attitude of Male and Female Agriculture Students in Tertiary Institutions Towards Self-Employment

Gender	N	Mean($\bar{x}$)	SD	Df	LS	t-cal	t-tab	Decision	Remark
Male	96	33.43	5.01	242	0.05	-0.38	1.96	Accepted	Not significant
Female	148	33.67	4.60						

N = Number of respondents, SD = Standard deviation, LS = Level of significance, Df = Degree of freedom, t-cal = Table value calculated, t-tab = t-critical

Sources: Field Work (2024)

The result in Table 5 shows the t-test summary analysis of male and female agriculture students' responses based on their attitude toward self-employment in agriculture in Delta State. The presented data showed that the t-calculated value (-0.38) is

less than the t-critical value of (1.96) at a 0.05 level of significance; the null hypothesis is therefore accepted. The male attitude response had a grand mean of 3.34 while the female attitude response was 3.37. This implies that there is no significant difference in the attitudes of male and female agriculture students in tertiary institutions towards self-employment in Delta State.

Hypothesis 2

There is no significant difference in the mean responses of male and female undergraduate students based on the attitude toward entrepreneurship in agriculture in Delta State.

Table 6

Summary of Independent t-test Analysis of the Difference Between Mean Responses of Male and Female Agriculture Students in Tertiary Institutions on Attitude Towards Entrepreneurship in Agriculture in Delta State.

Gender	N	Mean($\bar{x}$)	SD	Df	LS	t-cal	t-tab	Decision	Remark
Male	96	33.33	4.27						Not
				242	0.05	- 1.69	1.96	Accepted	Significant
Female	148	34.26	4.39						

P=0.05

Source: Field Work (2024)

Table 6 shows the summary of an independent t-test of male and female agriculture undergraduate students' attitudes toward entrepreneurship agriculture. The data showed that the t-calculated value was -1.69 and the t-critical value was 1.96 at 0.05 level of significance and 242 degrees of freedom, indicating that the t-calculated is less than the t-critical. Therefore, the null hypothesis is accepted. This indicates that there is no significant difference in the attitude of male and female agriculture students in tertiary institutions towards entrepreneurship in agriculture in Delta State.

Discussion of Findings

The Attitude of Agriculture Undergraduate Students Toward Self-Employment in Agriculture

The findings of research question one show that agriculture students in tertiary institutions have a highly positive attitude toward self-employment careers in the agricultural industry. This implies that agriculture undergraduate students are willing or likely to be interested in starting their agricultural businesses or ventures rather than seeking employment within an organization or establishment. This high positive attitude is in line with those of Bazuhair, (2022). The study revealed that the attitude of college students in business administration toward self-employment was high (positive) emphasizing the desire of young people to benefit from self-employment projects and their inclination towards it after graduation. However, in contradiction, the findings of Ajo (2018), Dutse, *et al*. (2019), Akpankaku (2019), and Abdukalem-Saghir, *et al.* (2018), revealed that preference for a career (self-employment) in agriculture is generally low. This means it is expected that since there is a negative attitude towards a career in agriculture, most students will be unwilling to take up a job in agriculture. Meanwhile, positive attitudes toward a behaviour increase the likelihood of favourable intentions. Therefore, the willingness of agriculture Students to engage in a behaviour (self-employment), a favourable attitude is required.

The Attitude of Agriculture Undergraduate Students Toward Entrepreneurship in agriculture in Delta State

The findings of research question two indicated that the attitude of undergraduate agriculture students toward entrepreneurship

in agriculture is positive. This implies that agriculture students will take risks and contribute to the growth and development of the agricultural sector through new venture creation and initiatives. Meanwhile, Kakkonen (2019) explains that an entrepreneurial attitude is about knowing what it means to be an entrepreneur with a tendency towards entrepreneurial behaviour. Relatively, people develop a positive attitude towards something if they will benefit from it. Thus, students tend to admire entrepreneurship if they expect benefits from it (Kusmintarti, Thoyib, Ashar & Maskie, 2014). This finding is in line with the study of Rezah and Hadi (2011). The study found that targeted agricultural students had a positive attitude toward entrepreneurship. The study implies that students who are interested in agriculture and receive targeted education or training in entrepreneurship are more likely to have a positive attitude toward starting their businesses within the agriculture industry. This suggests that targeted education programs can be effective in promoting entrepreneurship in specific fields. Supported, Jayasudha and Shantha, (2020) found in their study that the majority of the respondents (agricultural students) had a positive attitude toward agribusiness. Furthermore, this favorable attitude possessed by the students came as a result, that agricultural graduates indeed have better conditions for entrepreneurship compared to other graduates, which creates a lot of potential for agricultural-based entrepreneurship.

Additionally, the lack of employment opportunities in the public sector has doubled the necessity for entrepreneurship, particularly in agriculture (Jayasudha and Maruthu, 2020). Similarly, a study conducted by Shiri et al, (2013), the results showed that attitudes of agricultural students toward entrepreneurship have positive and significant effects on entrepreneurial motivation. The hypotheses also revealed that there are no significant differences in the mean responses of male and female agriculture undergraduate students' attitudes toward self-employment and entrepreneurship. This implies that both male and female students have high positive attitude toward self-employment and entrepreneurship in agriculture. This finding is consistent with the findings of Majumdar and Varadarajan (2012). The results of this study revealed that no gender differences exist in the factors that shape entrepreneurial intentions.

Level of Undergraduate Preparedness/ Intention Toward Entrepreneurship in Agriculture

The finding of research question three shows agriculture undergraduate students have a high positive level of preparedness/ intentions towards entrepreneurship in agriculture in Delta State. The findings indicated that agriculture undergraduate students are not only interested in self-employment within agriculture, as indicated in research question one, but also have a broader enthusiasm for entrepreneurial activities within the agricultural sector due to their exposure to entrepreneurial education and training programs. This finding is in line with studies conducted by Adom and Asare (2016); Pedrini, *et al*. (2017); Puni, *et al.* (2018); Nabi, *et al.* (2017). These studies found that the intentions to participate in entrepreneurship are often influenced by major factors such as entrepreneurship education and business training. Wale, *et al.* (2016) posited that entrepreneurship education influences the transformation of students' intention from seeking white-collar jobs to creating a personal venture. In agreement with the findings, Rodrigues et al. (2011) found that entrepreneurship education has a positive impact on the intention to start a new business. It means that by educating individuals about entrepreneurship, they become more likely to consider starting their businesses. This is in line with the findings of this study, it therefore shows that agriculture students possess a good understanding of business fundamentals, such as marketing, finance, and business planning, which can aid them in starting their ventures upon graduation.

The Felt Needs of Undergraduate Agriculture Students for Entry Self-Employment in Agriculture

The result of research question four shows that agriculture undergraduate students agreed to all the statement items as the felt needs that promote or hinder self-employment intention upon graduation. However, the finding showed that based on the mean ranking, the major felt needs for entry into a self-employment career in agriculture include: Access to resources/ funds, supportive friends/family, power supply, practical knowledge, mentorship program, business opportunities/skills, and Collaborative platform, are the felt needs to pursue self-employment in agriculture. This study's findings are in line with the study conducted by Olugbolo (2017). The study found that there is a positive and significant relationship between resources and the entrepreneurial readiness of participants in entrepreneurship training. This implies that when participants in entrepreneurship training have access to more resources, such as funding, supportive friends and family, and knowledge, they are more likely to be prepared and motivated to start their businesses. This suggests that adequate resources and support to students can help to increase or facilitate their readiness and success in starting and running their businesses. On a Similar note, Sandhu et al. (2011) reported that the availability of resources has a direct effect on entrepreneurial intentions in self-employment

Conclusion

Attitude play a vital role in shaping human behaviour, especially youths, about the choices they make, health practices, and daily behaviours. Entrepreneurship education is crucial to help young people develop entrepreneurial skills, attitudes, and behaviours, as well as embrace a career option. Entrepreneurship education can empower students, especially agriculture students of tertiary institutions to pursue entrepreneurial paths upon graduation and make meaningful contributions to the sustainability and growth of the agricultural industry. Despite that agriculture students have a positive attitude toward self-employment and entrepreneurship, they need to be motivated through financial grants, loans, and other resources that aid the establishment of ventures or businesses within their local environment. Regular teaching, workshops, and training on entrepreneurial and business management skills, with constant sensitization of students on the importance of self-employment and entrepreneurship to economic growth and development, using the experience of top existing entrepreneurs can enhance students' entrepreneurial mindset, which serves as a motivating factor in creating and running their businesses. This can reduce the level of unemployment among educated graduates and boost food security.

Recommendations

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

1. Educational institutions offering agriculture programs should integrate entrepreneurship education courses or modules that focus on skills, business planning, financial management, marketing strategies, and innovation in agriculture into their curriculum.
2. Tertiary institutions should adopt regular evaluation of entrepreneurship programs and training centres in other to incorporate best practices, for the improvement and effectiveness of their entrepreneurship education programs and make necessary adjustments based on feedback from their students and other concerned individuals
3. The Federal and State Governments should use their political willpower to promote a supportive environment that supports creativity and encourages innovation and risk-taking in the entrepreneurial space.
4. The state government should provide tertiary institutions with adequate infrastructure, modern agricultural and

entrepreneurial equipment/ facilities, build entrepreneurship centres, and quality personnel to aid the transmission of entrepreneurial skills to students.

5. University lecturers and other agricultural tertiary institution instructors should be provided with opportunities for continuous professional development in entrepreneurship and agricultural management, through workshops, seminars, certificate programs, etc., to improve their teaching efficiency, stay updated on industrial trends, expand their skill set, and remain competitive in the teaching profession and entrepreneurial landscape.

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COMPETENCIES REQUIRED BY YOUTH IN RABBIT PRODUCTION FOR SUSTAINABLE FOOD SECURITY IN GOMBE STATE

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Abstract
This study focused on competencies required by youths in rabbit production for sustainable food security in Gombe State. Four research questions and two hypotheses guided the study; descriptive survey research design was employed in the study. The population of the study was 151 made up of 82 teachers of Agricultural Science and 69 Agricultural Extension workers in the five Local Government Areas in Gombe North Senatorial Zone. There was no sampling, the entire population was involved in the study due to the manageable size of the population. An 83-competency item questionnaire was developed by the researchers and used for data collection. Five experts validated the instrument, Crobach Alpha (α) reliability method was used to determine the internal consistency of the questionnaire items and a reliability coefficient of 0.83 was obtained. The researcher and six trained research assistants administered 151 copies of the questionnaire on the respondents and 136 copies were retrieved given a retrieval rate of 90.06%. Data collected were analysed using mean and standard deviation to answer research questions, while t-test statistics was used to test the hypotheses at 0.05 level of significance. It was found that the youths required 15 competency items in planning for rabbit production, 11 competency items in processing of rabbit produce, 49 competency items in management of rabbits and 8 competency items in marketing of rabbit and its product. Based on the findings, it was recommended that the 83 competency items in rabbit production should be packaged into training modules to train the youths in rabbit production at the various vocational centres in the State.

Keywords: Youth, Competency, Rabbit, Production, Food Security

Introduction
Large proportion of Nigerian populace are suffering from malnutrition due to inability of the people to afford the high price of the sources of animal protein such as beef, mutton, pork, chicken and milk. This has led to inadequate intake of animal protein resulting to malnutrition in many people. Rabbit is a cheap source of animal protein that could substitute for other sources of animal protein with high prices. Rabbits according to Iwena (2014) are meat producing small livestock known for their high prolific ability, cheap feeding and high turn-over rate, requiring little investment to start with. Iwena further stated that the small body size, rapid growth, early maturity, and high reproductive potentials make rabbits a meat and skin producing small livestock. Mailafia et al (2010) stated that rabbit is an important livestock contributing to meat and protein production in Nigeria. Mailafia et al (2010) further stated that New Zealand, White Califonia, Angora and Rex are the common rabbit breeds in Nigeria. Moreover, Oseni and Lukefahr (2014) opined that small livestock species such as rabbit production enterprise should be promoted as tools for poverty alleviation as the contribution of the small holder rabbit enterprise to food security in developing countries is being recognised. Finzi (2000) stated the characteristics of small holder rabbit enterprise as follows: breeding rabbits in backyards, use of local materials for hutches and equipment, feeding on fresh forage and kitchen waste, integration of rabbits with other farm animals, sharing of family labour, consumption of rabbits by household and the sale of excess stocks in the local market. Finzi noted that rabbit production is important to the economy of some developing countries like Nigeria, and

this justify the need for the sustainability of the enterprise. In this study, rabbit production is an enterprise in animal production in which youths in Gombe State could be trained to acquire knowledge, skills and attitude in the enterprise for self-reliance and sustainable protein consumption in the State.

Youth, according to Barau and Afrad (2017) is an individual within the period of transition from childhood to adulthood, encompassing process of sexual maturation and growing social and economy autonomy from parents. Also, Food and Agriculture Organization (2013) described youth as individual that falls within the age bracket of 10 to 25 years. Moreover, Ukonze, *et al*. (2019) opined that youthfulness is a transition period between childhood and adulthood. In this study, youths are groups of individuals between the ages 15 to 25 years that were idle and roaming the streets of many villages, towns and city of Gombe doing nothing tangible for a living, rather they scout for kitchen refuse and left-over food in dustbins and garbage. Due to the idleness of these youths, they involve themselves in social vices like stealing, raping, political thuggery, kidnapping and suicide bombing. These youth are strong, vibrant and energetic, they could be trained to acquire competencies in rabbit production enterprise which will help engage them in meaningful and profitable activities and reduce the menace of their idleness in the State.

Competency in the view of Usoro et al (2012) is a combination of knowledge, skills and behaviour used to improve performance, stating further that competency is a state or quality of being adequately or well qualified to perform a task repeatedly with the same level of proficiency. Ugwuoke and Ifeanyi (2012) described competency as the knowledge, skills and attitude required to effectively and efficiently process fresh pineapples into different products. In the same vein, Ekele, *et al*. (2020) explained competency as the ability of pastoral farmers to possess sufficient knowledge, skills, attitudes and judgement required for successful pasture preservation in silage, hay and straw. In this study, competency is the knowledge, skill and attitude in rabbit production enterprise required by youths in Gombe State for sustainable protein consumption and food security.

Food security according to World food summit report in Murtela and Abdulrazak (2019) exist when all people at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preference for an active and healthy life. Asogwa et al (2020) stated that food security is a state of having reliable access to sufficient quality and affordable pig meat (pork) in Abia State. Food security in this study therefore, implies the adequate and sufficient provision of rabbit meat for consumption of people in Gombe State through the involvement of youths in a successful and profitable rabbit production enterprise. For the youths to be profitably involved in rabbit production enterprise, they need to acquire knowledge, skills and attitude in the enterprise through training given by teachers of Agricultural Science and Agricultural Extension Workers.

Agricultural Science teacher according to Olaitan, *et al*. (2010), is someone who has acquired the basic knowledge and skills in agriculture and pedagogy, and capable of changing learner's behaviour and skill through instruction. Agricultural Science teacher in this study is an individual who has acquired the knowledge, skills and attitude in agriculture and pedagogy and has the sole responsibility of imparting knowledge, skills and attitude in agriculture to students between the age bracket of 15-22 years in Senior Secondary Schools in Gombe State while Agricultural Extension Workers in the view of Ugwuoke and Ifeanyieze (2020) are trained personnel employed by the government with the aim of disseminating agricultural research information to farmers in order to help them improve on their farming skills. Agricultural Extension Workers in relation to this study are individuals trained to acquire knowledge, skills and attitude in agriculture, employed by the government into Ministry of Agriculture

and other governmental agricultural agencies and were charged with the responsibility of imparting to farmers the practice of agriculture. Both the Agricultural Science Teachers and Agricultural Extension Workers have the capacity of training the youth in the State to acquire knowledge, skills and attitude in rabbit production.

The researcher observed the heavy concentration of the youth in most of the local government headquarters within the state, while greater numbers of these idle youths are in Gombe metropolis. These youths called "Almajiri" only wake up to roam the streets from morning to night doing nothing tangible and meaningful to earn a living. In the process of looking for what to eat, put on and be well dressed like other youths who are under the care of their parents, many of them are involved in social vices such as stealing, raping, street fighting, and kidnapping, suicide bombing and political thuggery. Some of these youths have constituted themselves as a threat to the people in the community. In order to curb the menace, of these youth in Gombe State, it is imperative therefore, to identify competencies in rabbit production required by youth for self-reliance, and sustainable rabbit production and food security in the State.

Purpose of the Study

The purpose of this study was to identify competencies required by youth in rabbit production for sustainable food security in Gombe State. Specifically, the study sought to:

i. identify competencies required by youth in planning for rabbit production;
ii. determine competencies required by youth in management of rabbit production enterprise;
iii. ascertain competencies required by youth in processing of rabbit produce; and
iv. determine competencies required by youth in marketing of rabbit products.

Research Questions

1. What are the competencies required by youths in planning for rabbit production?
2. What are the competencies required by youths in management of rabbit production enterprise?
3. What are the competencies required by youths in processing of rabbit produce?
4. What are the competencies required by youths in marketing of rabbit produce and products in Gombe State?

Hypotheses

The following hypotheses were tested at 0.05 level of significance.

$H_0$1: There is no significant difference in the mean rating of the responses of Agricultural Science teachers and Agricultural Extension Workers on the competencies required by youth in planning for rabbit production.

$H_0$2: There is no significant difference in the mean rating of responses of Agricultural Science teachers and Agricultural Extension Workers on the competencies required by youth in management of rabbits' production enterprise.

Methodology

This study adopted descriptive survey research design. The design was suitable for the study as data was collected from a sample of the respondents using questionnaires and the findings were generalized on the entire population. The study was carried out in Gombe North Senatorial Zone which is made up of five Local Government Areas; Namely Dukku, Funakaye, Gombe, Kwami and Nafada local government areas. The population of the study was 151 made up of 82 teachers of Agricultural Science and 69 Agricultural Extension Workers in the five local government areas within Gombe North Senatorial Zone. There was no sampling as the entire population was involved in the study due to the manageable size of the population. A structured questionnaire named Competencies Required in Rabbits Production Questionnaire (CRRPQ) was used as the instrument to collect data for the study. The instrument was developed by the researchers from the review of related

literature. The (CRRPQ) was divided into two sections. Section A contained information on the personal data of the respondents while section B contained information on the competencies required by youths in rabbit production for sustainable food security in Gombe State. Section B was divided into four (4) parts. Part 1 contained competency items in planning for rabbit production, part 2 contained competency items in management of rabbits, part 3 contained competency items in processing of rabbits produce and part 4 contained competency items on marketing of rabbit products. The (CRRPQ) had four (4) response options of Highly Required (HR), Averagely Required (AR), Slightly Required (SR) and Not Required (NR) with corresponding value of 4, 3, 2 and 1 respectively. The instrument (CRRPQ) was validated by five experts, three of the validators were from Agricultural Education unit in the Department of Science Education, Federal University of Kashere while the other two were from Animal Science Department, Federal University of Kashere. The suggestions of the validators was effected to produce the final instrument that was used to collect data for the study. The reliability of the instrument was determined using Cronbach Alpha (α) method and the internal consistency of 0.83 was obtained. The high value of 0.83 shows that the instrument was highly reliable.

The researchers and six trained research assistants administered 151 copies of the instrument on the respondents and 72 copies were retrieved from teachers of Agricultural Science while 64 copies from Agricultural Extension Workers. The retrieval rate of 90.06% was appropriate for the study. Mean and standard deviation were employed to analyse the data collected for the study, to answer the research questions; while t-test statistic was used to test the hypotheses at 0.05 level of significance.

Decision was taken as follow: from the response options 4+3+2+1 = 10/4 = 2.5

The cut-off point was 2.50 therefore; any item with the mean value of 2.50 and above was regarded as required while any item with a mean value below 2.50 was regarded as not required. On hypotheses, any item whose p-value is equal to or greater than 0.05 that is $p>0.05$ was regarded as not significant therefore the null hypotheses will be accepted while any item whose p-value is less than 0.05 that is $p< 0.05$ was regarded as significant, and the null hypotheses will be rejected.

Results

Research Question 1

What are the competencies required by youths in planning for rabbit production?

Table 1

Mean Rating of the Responses of Agricultural Science Teachers (AST) and Agricultural Extension Workers (AEW) on the Competency in Planning for Rabbit Production Required by Youths for Sustainable Food Security (N=136)

S/N	Competency in Planning for Rabbit Production	Mean ($\bar{x}$)	SD	Remark
1.	Formulate specific objectives for rabbit production	3.50	0.83	Required
2.	Review the objectives periodically to economic situation	3.12	0.81	Required
3.	Identify major activities required to achieve the objectives	3.26	0.80	Required
4.	Draw up plans to cover different stages of rabbit production	3.14	0.83	Required
5.	Decide where to locate rabbitry	3.24	0.92	Required
6.	Identify relevant personnel to assist in the production	2.55	0.95	Required
7.	Set goals for rabbit production	3.04	0.91	Required
8.	Identify relevant input required for rabbit production	3.36	0.92	Required
9.	Identify rabbit species to produce	3.37	0.85	Required
10.	Decide the type of rabbit house to build	3.03	0.68	Required
11.	Identify suitable management required for rabbit production	3.02	0.69	Required
12.	Identify market requirement and outlet for rabbit produce	2.86	0.77	Required
13.	Identify sources of financing rabbit production	3.29	0.94	Required
14.	Budget for rabbit production	3.12	0.95	Required
15.	Identify various records to keep in rabbit production	3.26	0.64	Required

Table 1 revealed that the mean values of the respondents (Teachers and Extension Workers) on the competency required in planning for rabbit production ranges from 2.86 to 3.37 and were above the cut-off point of 2.50. This implies that both Agricultural Science Teachers and the Extension Workers agreed that the 15 competency items in planning for rabbit production were required by the youths. It was revealed in the table that the standard deviation of the (15) competency items range from 0.64 to 0.95 and were low indicating that the respondents were not too far from the mean and from one another in their responses.

Research Question 2

What are the competencies required by youths in the management of rabbit production enterprise?

Table 2

Mean Rating of the Responses of Agricultural Science Teacher and Agricultural Extension Workers on the Competency Required by Youths in the Management of Rabbit Production Enterprise for Sustainable Food Security (N=136)

S/N	Competency Required by Youths in Management of Rabbit Production Enterprise	Mean ($\bar{x}$)	SD	Remark
A.	**House Management**			
1.	Choose a suitable site for rabbit production enterprise	2.65	0.93	Required
2.	Clear the vegetation on the site	3.35	0.71	Required
3.	Select the type of rabbit house to construct	2.69	0.78	Required
4.	Identify the right building materials for the rabbit house	3.01	0.85	Required
5.	Select appropriate workers to construct the rabbit house	3.16	0.69	Required
6.	Construct a hatch which is 2m long, 1m deep and 1m wide	3.38	0.88	Required
7.	Plaster the walls of the pen with cement	3.32	0.76	Required
8.	Provide ventilation to reduce heat in the hatch	3.11	0.56	Required
9.	Provide boxes for shelter and nest boxes for kids	3.40	0.67	Required
10.	Provide water and feeding trough in the hatch	3.33	0.96	Required
11.	Build a wooden or bamboo shed to shade the entire pen	2.68	0.99	Required
12.	Erect wire mesh to control predators from the hatch	3.10	0.75	Required
13.	Check for any damage and repair quickly	3.03	0.99	Required

B.	**FEEDING AND REARING MANAGEMENT**			
14.	Identify types of feed for feeding the rabbit	3.23	0.97	Required
15.	Identify sources of feed	2.92	0.69	Required
16.	Identify feed requirement at each stage of development	3.42	0.78	Required
17.	Feed rabbit to specifications	3.32	0.74	Required
18.	Provide water in the trough	3.11	0.75	Required
19.	Keep records of feed used	3.31	0.85	Required
20.	Observed rabbit signs of nutrient deficiency	3.41	0.61	Required
21.	Allow rabbit to graze and exercise their body	3.63	0.84	Required
22.	Weigh rabbit regularly to determine their weight	3.35	0.69	Required
23.	Clean the feeding and water trough regularly	2.92	0.53	Required
24.	Quarantine newly purchased rabbit before stocking	2.87	0.87	Required
25.	Feed pregnant doe with recommended balanced diet	3.27	0.82	Required
C.	**PRODUCTION MANAGEMENT**			
26.	Select appropriate breeding stock	3.76	0.53	Required
27.	Determine the time to put rabbit in the breeding pen	3.17	0.97	Required
28.	Take the doe to the buck box for crossing	3.27	0.78	Required
29.	Breed rabbits within 1 minute if mating is successful	3.22	0.67	Required
30.	Remove the buck from the doe to avoid fight	3.14	0.79	Required
31.	Conduct pregnancy test for the doe	2.81	0.83	Required
32.	Determine gestation period of the doe	3.41	0.71	Required
33.	Provide nest box for the doe to pull fur	2.69	0.81	Required
34.	Monitor the doe after kid ling to control cannibalism	3.65	0.55	Required
35.	Provide enough warmth in the next trough electric light	3.23	0.77	Required
36.	Separate bunny/kids from the doe after wearing	2.99	0.78	Required
37.	Keep breeding/production records regularly	3.50	0.68	Required
D.	**Health Management**			Required
38.	Identify common diseases of rabbit	3.56	0.72	Required
39.	Identify common pest of rabbit	3.17	0.68	Required
40.	Spray pen with chemicals to eradicate insect pest	3.10	0.76	Required
41.	Maintain high level of hygiene and sanitation in the hatch	3.66	0.69	Required
42.	Observe rabbit closely for any symptoms of diseases	3.41	0.88	Required
43.	Diagnose rabbit diseases for proper treatment	3.60	0.64	Required
44.	Isolate sick rabbit from health rabbit	3.02	0.76	Required
45.	Treat the sick rabbit at the veterinary centre	3.50	0.70	Required
46.	Dispose dead rabbit to prevent infection of healthy rabbits	3.76	0.79	Required
47.	Keep proper records of health management in the rabbi try	3.29	0.75	Required

Table 2 shows that all the 47 items on the competency in management of rabbit had mean scores ranging from 2.65 to 3.96 and were above the cut-off point of 2.50. This indicates that Agricultural Science Teachers and Extension Workers agreed that all the 47 competency items in management of rabbit were required by the youths. Table 2 also revealed that the standard deviation of the entire 47 competency items ranges from 0.53 to 0.99 and were low, indicating that the respondents were not too far from the Mean and from one another in their responses.

Research Question 3

What are the competencies required by youths in processing rabbit produce?

Table 3

Mean Rating of the Responses of Agricultural Science Teachers and Extension Workers on the Competency Required by Youths in Processing Rabbit Produce for Sustainable Food Security (N=136)

S/N	Competency in Processing Rabbit Produce	Mean ($\bar{x}$)	SD	Remark
1.	Identify rabbit for slaughtering	3.60	0.64	Required
2.	Slaughter the mature bucks	3.64	0.74	Required
3.	Process the slaughtered bucks for skin	3.39	0.72	Required
4.	Cut slaughtered bucks into sizeable meats	3.21	0.85	Required
5.	Cook rabbit meat	3.61	0.67	Required
6.	Fry cooked rabbit meat	2.97	0.63	Required
7.	Add sausage to rabbit meat	3.51	0.53	Required
8.	Roast fresh rabbit meat	3.65	0.59	Required
9.	Provide storage for rabbit meat awaiting market	2.75	0.71	Required
10.	Feed live rabbit awaiting market	2.99	0.88	Required
11.	Grade rabbit and its product for market	3.30	0.79	Required

Table 3 revealed that the mean values of the respondents (Teachers and Extension Workers) on the competency in processing of rabbits produce ranges from 2.75 to 3.64 and were above the cut-off point of 2.50. This indicates that Agricultural Science Teachers and Extension Workers agreed that all the 11 competency items in processing of rabbit produce were required by youth. It was also revealed in table 3 that the standard deviation of all the 11 competency items ranges from 0.53 to 0.85 and were low indicating that respondents were not too far from the mean and from one another in their responses.

Research Question 4

What are the competencies required by youths in marketing of rabbit products?

Table 4

Mean Rating of the Responses of Agricultural Science Teachers and Extension Workers on the Competency Required by Youths in Marketing of Rabbit Products for Sustainable Food Security (N=136)

S/N	Competency in Planning for Rabbit	Mean ($\bar{x}$)	SD	Remark
1.	Local market for rabbit production	3.09	0.76	Required
2.	Advertise rabbit produce to promote patronage	2.90	0.75	Required
3.	Fix price for different grades of rabbit and its product	2.96	0.91	Required
4.	Package rabbit and rabbit product for market	3.17	0.85	Required
5.	Transport rabbits and product to customers	3.31	0.74	Required
6.	Distribute rabbit and its product to customers	3.32	0.84	Required
7.	Sale rabbit for maximum profit	3.23	0.71	Required
8.	Keep records of sale of rabbit and its product	2.75	0.67	Required

Table 4 shows that all the eight (8) items on the competency in the marketing had mean scores ranging from 2.75 to 3.32 and were above the cut-off point of 2.50. This indicates that, Agricultural Science Teachers and Extension Workers agreed that all the eight (8) competency items in marketing of rabbit were required by youth. It was revealed in Table 4 that the standard deviation of all the eight (8) competency ranges from 0.67 to 0.91 and were low indicating that the respondents were not far from mean and from one another in their responses.

Hypothesis 1

There is no significant difference in the mean rating of the responses of Agricultural Science teachers and Agricultural Extension

Workers on the competencies required by youth in planning for rabbit production.

Table 5

The t-test Analysis of the Mean Rating of the Responses of Agricultural Science Teachers and Extension Workers on the Competency Required by Youth in Planning for Rabbit Production

Variable	N	Mean	SD	SE	p-value	Remark
Teacher of Agriculture	72	3.26	0.81	1.38	0.14	Not Significant
Extension Workers	64	2.68	0.62	1.71		

Table 5 revealed that the p-value of the t-test analysis is 0.14 which is greater than 0.05, that is (0.14>0.05) this implies that there was no significant difference in the mean rating of the responses of Agricultural Science Teachers and Extension Workers on the competencies required by youths in planning for rabbit production. Therefore, the null hypothesis of no significant difference is upheld.

Hypothesis 2

There is no significant difference in the mean rating of responses of Agricultural Science teachers and Agricultural Extension Workers on the competencies required by youth in management of rabbits' production enterprise.

Table 6

The t-test Analysis of Mean Rating of the Responses of Agricultural Science Teachers and Extension Workers on the Competency Required by Youth in the Management of Rabbit Production Enterprise

Variable	N	Mean	SD	SE	p-value	Remark
Teacher of Agriculture	72	3.16	0.81	0.17	0.16	Not Significant
Extension Workers	64	3.25	0.76	0.31		

It was revealed in Table 6 that the p-value of the t-test analysis is 0.16 which is greater than 0.05, that is (0.16>0.05) this implies that there was no significant difference in the mean rating of the responses of Agricultural Science Teachers and Extension Workers on the competencies required by youth in the management of rabbit production enterprise. Therefore, the null hypothesis of no significant difference is upheld.

Discussion of Findings

The findings of the study revealed that both Agricultural Science Teachers and Extension Workers agreed that youth required all the 15 competency items in planning for rabbit production, 47 competency items in the management of rabbit production enterprise, 11competency items in processing of rabbit produce and 8 competency items in marketing of rabbits and its product. The findings of this study was in agreement with the findings of Ugwuoke and Ifeanyieze (2012) in a study carried out on pineapple processing competencies required by NCE Agricultural Education graduates for sustainable economic transformation where it was found out that both pineapple farmers and Extension Workers agreed that NCE Agricultural Education graduates required 15 competency items in processing fresh pineapple into pineapple juice, 9 competency items in processing fresh pineapple into pineapple syrup and 12 competency item in processing fresh pineapple into pineapple jam. Furthermore, the findings of this study were in consonance with the findings of Ukonze, *et al.* (2019) in a study conducted on strategies for engaging rural youths in agric entrepreneurship for sustainable development in Kogi State where it was found out that both

lecturers and staff of the Elliel Consult Company agreed on 12 strategies for engaging rural youths in agric entrepreneurship and 14 agricpreneurial opportunities available for rural youth for sustainable development. Moreover, the findings of this study was corroborated by the findings of Asogwa et al (2020) in a study carried out on bio-security measures required for increasing pig survivability for food security and economic recovery in Abia State where it was found out that both farmers and Extension Workers agreed that 13 item on bio-security isolation measures were required for increasing pig survivability, 8 items on bio-security traffic control measure were required for pig survivability, 11 items on bio-security sanitation measures were required for pig survivability and 9 bio-security pest control measures were required for pig survivability.

The findings of this study on the competencies required by youths in rabbit production for sustainable food security in Gombe State was corroborated by the findings of Jane and Anaele (2020) in a study carried out on carpentry and Joinery skills required by Technical College graduates for sustainable development in Edo and Delta State, where it was found out that 30 general skills for employment and 55 practical skills in carpentry and Joinery works were required by Technical College graduates for sustainable development in Edo and Delta State. Moreover, the findings of this study was in consonance with the findings of Lawal, *et al.* (2022) on competencies required by Agricultural Science Teachers for effective teaching of goat production to secondary school students in Billiri Local Government Area of Gombe State where it was found out that Teachers of Agricultural Science required 10 competencies in planning for goat production, 29 competencies in housings and breeding of goat and 17 competencies in health and marketing of goats.

Conclusion and Recommendation

Many people in Nigeria, particularly Gombe state suffer malnutrition due to low protein intake as they cannot afford the high price of animal protein sources such as beef, meat, mutton, pork, chicken, fish and milk. Rabbits, are cheap, highly prolific, easy to produce and manage small livestock that could be a better alternative for the costly sources of animal protein, if the youths roaming the streets of various villages, towns and city in the state, who have constituted themselves as nuisance in the state through various crimes could be engaged in profitable rabbit production for sustainable food security in the state. Teachers of Agricultural Science and Agricultural Extension Workers therefore, agreed that these youth required competencies in rabbit's production identified by this study.

It was therefore recommended based on the findings of this study that the identified 81 competency items in rabbit production should be packaged into training modules by the youth on rabbit's production at the various vocational centres in the State.

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PREFERENCES OF UNDERGRADUATES FOR ENTREPRENEURSHIP IN AGRICULTURE IN DELTA STATE UNIVERSITY CENTRE FOR ENTREPRENEURSHIP STUDIES

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Abstract

This study examined the preferences of undergraduates for entrepreneurship in agriculture in Delta State University Abraka Nigeria. The study adopted a descriptive survey research design. Three research questions and two hypotheses guided the study. The population for the study was 5000 registered 300 level undergraduates in five faculties offering entrepreneurship courses in Delta State University Abraka. A simple random sampling technique was used which gave a sample size of 100. A 38-item structured questionnaire titled Preferences of undergraduates for entrepreneurship in agriculture was developed by the researcher for the study and used to collect data from the respondents. The questionnaire items were validated by three experts, two from the Department of Agricultural Science education and one from the Department of Measurement and Evaluation both from Delta State University Abraka. Cronbach Alpha method was used to establish the reliability of the items, and a coefficient of 0.95 was obtained. Mean and Standard Deviation were used to answer the research questions, while t-test was used to analyze the null hypotheses at 0.05 level of significance. The study revealed that the extent to which undergraduates have preferences for entrepreneurship in agriculture is very high; the most preferred areas are fishery/hatchery which ranked the highest followed by poultry production. Also, the undergraduates' preference to livestock feed production is high. The result further revealed that there was no significant difference in the rating of the responses of male and female for areas undergraduate express preferences for in entrepreneurship in agriculture and in the mean ratings of the responses of male and female response on their preferences for agriculture as an entrepreneurial interest. Based on the findings of the study, the researcher recommended among other things, the need for government to set up special grants for frequent training and retraining of lecturers within and outside the country to bring them up-to-date with modern ideas and teaching methods of the subject matter.

Keywords: Preferences, Entrepreneurship, Entrepreneurship education, Agriculture.

Introduction

Entrepreneurship is essential for economic growth and development as it contributes to the formation of small and medium-sized firms that have significant impacts on living standards, job creation, and wealth generation (Acs & Szerb, 2009). Initiatives to encourage entrepreneurship have been put in place in nations like Nigeria hence the Federal Government of Nigeria, through the National Universities Commission, developed an entrepreneurship course where undergraduate students are required to take entrepreneurship courses (Nnafukko & Muyia, 2010).

Undergraduate education is an educational level taken in order to gain one's first tertiary degree. Hence, in many subjects and many educational systems, undergraduate education is post-secondary education up to the level of a bachelor's degree, while students of higher degrees are known as graduate students. Undergraduate programme includes all types of studies, training or training for research at the post-secondary level provided by universities or other educational institutions approved by government. According to Nwangwu (2007), undergraduate programme is referred to as the education given after

secondary education in universities, college of education, polytechnics, monotechnics, as well as those institutions offering correspondence courses. The goals of undergraduate programme according to the Federal Republic of Nigeria (2004) include; Contributing to national development through high level relevant human power training, developing and inculcating proper values for the survival of the individual and society, developing the intellectual capacity of individuals to understand and appreciate their local and external environments, acquiring both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society, promoting and encouraging scholarship and community service, forging and cementing national unity and promoting national and international understanding and interaction. (Federal Republic of Nigeria 2004, p.6). For undergraduates to acquire physical and intellectual skills in the universities, certain programmes such as, Entrepreneurship Development Programmes are expected to be on ground so as to achieve the objectives of tertiary institutions in the country.

The establishment of Entrepreneurship Study Centers in all of the Nigerian universities was approved in 2011 by the Federal Ministry of Education and the National Universities Commission (N.U.C.). The University of Nigeria, Nsukka, which has a Center for Entrepreneurship and Development Research (CEDR), and Delta State University, Abraka, which also has a Centre for Entrepreneurship Studies, are just a few universities that offer entrepreneurship as a course of study. It is anticipated that the Entrepreneurship Study Centres will create and provide avenues to promote and advance entrepreneurship. Every nation needs a strong education system to produce the trained labor necessary to meet its economic goals and objectives (Pulka, et al., 2014).

According to Adeogun (2003), education is crucial for combating unemployment, poverty, and ignorance. The Federal Government of Nigeria (2004) in her National Policy on Education aims to develop individuals' intellectual capacity, physical and intellectual skills, and empower them for a dynamic society. Universities should provide quality education and research, granting academic degrees in various courses. Agriculture must extend beyond occupational knowledge, offering students creative opportunities and career opportunities.

Oyelana and Adeyemi (2019) defined entrepreneurship as "the act of taking calculated risks to exploit opportunities in an environment with the expectation of creating value, both for the entrepreneur and the society at large." They emphasized on the risk-taking aspect of entrepreneurship and its potential impact on value creation. In the light of the above, Entrepreneurship education can be defined as the systematic imparting of knowledge, skills, and mindsets that enable individuals to recognize, create, and pursue opportunities for innovation, value creation, and enterprise development (Fayolle & Gailly, 2015).

Thus, entrepreneurship education aims at inculcating in an individual the ability to seek information and advice; make decisions; plan one's time and energy; carry through an agreed responsibility; communicate and negotiate; deal with people in power and authority; solve problems; resolve conflicts; evaluate performance and use feedback to improve; cope with stress and tension; and achieve self-confidence (Agu, *et al.,* 2013). Entrepreneurship Education has many objectives, but the major objective is to develop enterprising people and inculcate in students an attitude of self-reliance using appropriate learning processes (Centre for Entrepreneurship Development and Research, University of Nigeria, Nsukka 2006:8). Agu (2013) emphasizes nurturing entrepreneurial skills through education for responsible, enriching small business endeavors benefiting individuals and communities.

Ikeoji (2018) defined entrepreneurship in agriculture as the willingness and ability of an individual to manipulate human and material resources in agriculture to yield an anticipated outcome. It is therefore the process of combining the attributes of agricultural know-how and entrepreneurship into production of agricultural produce to generate wealth and employment in a society. He stated further that the major areas of entrepreneurship in agriculture are production which includes various crop and animal production enterprises. They include; Mini-livestock enterprise, annual crop production enterprise, estate plantation enterprise, poultry production enterprise, piggery production enterprise, quail production, aquaculture or fish farming, processing, packaging, transportation and storage, distribution of agricultural produce and finished by-products, food services amongst others.

Preferences is the desire of an individual to spark interest in attempting something new, striving to get benefits, and taking into account the risks associated with managing their resources in order to inspire the person to produce welfare and add value to society through resource management (Ariyanti, 2018). Overall, preferences play an important role in shaping attitudes and behaviors towards agricultural entrepreneurship, which can have significant impacts on animal welfare and agricultural sustainability which suggests that understanding individuals' preferences is essential in designing effective entrepreneurship education programs and promoting entrepreneurial behavior in agriculture (Jones & Brown, 2019).

Given this premise, it is imperative to determine undergraduates' preferences for entrepreneurship in agriculture to improve their entrepreneurial career and identify areas for improvement. This framework can guide students in enhancing their potential in agriculture courses (Diego, 2014). Nigeria's population is increasing, but graduate job opportunities are scarce, leading to unemployment and social vices. To address this, the government has established Entrepreneurship Centres to instill entrepreneurial skills in graduates. However, undergraduates in universities lack the necessary skills and knowledge to engage in agriculture. The Nigerian Government through the NUC has made it compulsory for every undergraduate to offer entrepreneurship courses, but some students still lack favorable attitudes and interest in entrepreneurship, hindering their ability to create jobs and become entrepreneurs (Madumere, 2006; Samuel, *et al*., 2012). This study is therefore set to fill the gap in literature by investigating the Preferences of Undergraduates for Entrepreneurship in Agriculture in Delta State University, Abraka Centre for Entrepreneurship Studies (CES).

Purpose of the Study

The main purpose of this study was to determine the Preferences of Undergraduates for Entrepreneurship in Agriculture in Delta State University, Abraka Centre for Entrepreneurship Studies. Specifically, the study sought to:

i. determine Areas in agriculture in which Delta State University Undergraduates express their preference for entrepreneurship endeavour;
ii. determine Undergraduates Preference for Agriculture as an entrepreneurial interest; and
iii. find out the extent to which resource persons/facilities are being provided for undergraduates in the University for enhancement of entrepreneurial skills.

Research Questions

The following research questions have been formulated to guide the study:

1. Which areas in agriculture do Delta State University Undergraduates express their preference for entrepreneurship?
2. To what extent do undergraduates have preference for agriculture as an entrepreneurial interest.
3. To what extent are resource persons/ facilities used for the enhancement of

entrepreneurial skills among undergraduates?

Hypotheses

The following null hypotheses are formulated to guide the study and will be tested at 0.05 level of significance.

HO_1: There is no significant difference between the responses of male and female undergraduates on areas in agriculture DELSU students express their preference for in entrepreneurship studies.

HO_2: There is no significant difference between the responses of male and female undergraduates on the extent of preference for agriculture as an entrepreneurial interest.

Methodology

The study used a descriptive survey research design at Delta State University Abraka, involving 5000 university undergraduates who registered entrepreneurship courses (CES Office). A sample of 100 students was drawn from five faculties, with 80 responses recovered. A structured questionnaire was designed and used for data collection, with response options and values of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). The instrument was validated by three experts, and a Cronbach Alpha's technique was used to determine a coefficient of 0.95 was obtained. Data were analyzed using mean and standard deviation, and a t-test was used to test the hypothesis. A four-point scale was used to determine preferences for entrepreneurship in agriculture. Hence a decision rule of mean greater or equal to 2.5 signifies agree while a mean less than 2.5 signifies disagree. In taking decision on the hypotheses, the t-calculated was compared with the t-critical and if the t-calculated was less than the t-critical, the null- hypothesis was accepted and if the t-calculated was greater than the t-critical, the null-hypothesis was rejected.

Results

Research Question1

Which areas in agriculture do Delta State University Undergraduates express their preference for entrepreneurship?

Table 1

Mean, Standard Deviation and t-test Analysis of the Responses of Male and Female Undergraduate Responses Regarding Areas of Preference in Agriculture in DELSU (N=80; X_1

S/N	Item Statement	Male (N = 33)		Female (N= 47)		t-test		Remarks
		X1	SD_1	X2	SD_2	t-cal	t-tab	
1.	Fishery/hatchery	3.42	0.50	3.62	0.46	-1.84	1.99	NS
2.	Snailery	2.78	0.55	2.83	0.19	-0.57	1.99	NS
3	Piggery	2.23	0.61	2.78	0.46	-4.59	1.99	NS
4.	Feed production	2.67	0.63	2.94	0.38	-2.38	1.99	NS
5.	Poultry production	3.12	0.50	3.02	0.21	1.22	1.99	NS
6.	Rabbit rearing	2.36	0.51	2.45	0.46	-0.82	1.99	NS
7.	Quail production	2.35	0.55	2.33	0.70	-6.71	1.99	NS
8.	Vegetable farming	2.74	0.73	2.64	0.70	0.61	1.99	NS
9.	Cassava production	2.81	0.71	2.65	0.35	1.33	1.99	NS
10.	Grasscutter farming	2.21	0.50	2.43	0.31	-2.42	1.99	NS
11.	Flour milling	2.50	0.62	2.57	0.46	-0.5	1.99	NS
12.	Oil palm processing	2.63	0.51	2.75	0.58	-0.95	1.99	NS

= 33 Male Undergraduates, X_2 =47 Female Undergraduates)

Key: N= number of respondents, X_1= mean of male undergraduates, SD_1= standard deviation of male undergraduates, X_2= mean of female undergraduates SD_2 = standard deviation of female undergraduates.

Data in Table 1 shows the various areas in agriculture undergraduates express their preference for in entrepreneurship. The most preferred areas are fishery/hatchery 3.42 and 3.62 respectively which ranked the highest followed by poultry production (3.12 and 3.02). In short, all the items show the various areas in agriculture undergraduates express their preference for as shown by their mean responses. However, items 6, 7 and 10 (rabbit rearing, quail production and grasscutter farming) were below the 2.50 cut-off mark, showing that that they did not prefer those areas for entrepreneurship. The values of standard deviation range from (0.19 – 0.73), which showed that the respondents were close to the mean (x) and to one another in their responses.

The table also showed that the items had their t-calculated less than the t-table value at 0.05 level of significance and at 78 degrees of freedom. This indicated that there was no significant difference in the rating of the responses. Thus, the null hypothesis of no significant difference was accepted for areas undergraduate express preferences for in entrepreneurship in agriculture.

Research Question 2

To what extent do undergraduates have preferences for agriculture as an entrepreneurial interest?

Table 2

Mean, Standard Deviation and t-test Analysis of the Responses Mean Responses of Male and Female Undergraduates on the Extent of Preferences for Agriculture as an Entrepreneurial Interest (N=80: X1= 33 Male Undergraduates, X2=47 Female Undergraduates)

S/N	Item Statement	Male (N = 33)		Female (N = 47)		t-test		Rmk
		X1	SD_1	X2	SD_2	t-cal	t-tab	
1.	I prefer livestock feed production because it reduces cost incurred in livestock	3.12	0.66	3.34	0.16	-2.20	1.99	NS
2.	I prefer poultry production because of its large market demand	2.72	0.82	3.51	0.38	-5.78	1.99	NS
3.	I prefer grass cutter farming because of its cheap cost of feeding	2.64	0.45	3.02	0.54	-3.13	1.99	NS
4.	I prefer snail farming because it is not capital and management intensive	2.73	0.48	3.04	0.55	-2.61	1.99	NS
5.	I prefer piggery because it is highly prolific	2.54	0.63	2.82	0.30	-2.65	1.99	NS
6.	I prefer vegetable family because it serves as a source of supplementary income	2.66	0.72	3.20	0.26	-4.73	1.99	NS

Key: N= number of respondents, X_1= mean of male undergraduates, SD_1= standard deviation of male undergraduates, X_2= mean of female undergraduates SD_2 = standard deviation of female undergraduates.

Table 2 shows the mean responses of the reasons for undergraduate's preferences for agriculture as an entrepreneurial interest. The response shows undergraduates' preference for livestock feed production because it reduces cost incurred in livestock produce is very high 3.12 and 3.34 respectively. On the preference scale, the mean response of each of the six 6 items shows that undergraduates have positive preferences for agriculture as an entrepreneurial interest. The standard deviation values range from (0.16 – 0.82), which indicated that the responses do not deviate widely from the mean. The table had their t-calculated value less than the t-table value at 0.05 level of significance and at 78 degrees of freedom. This indicated that there was no significant difference in the mean ratings of the responses of male and female responses in their preferences for agriculture as an entrepreneurial interest.

Research Question 3

What is the extent to which resource persons/facilities are put in place for the enhancement of entrepreneurial skills?

Table 3
Mean Response of the Extent to which Resource Persons/Facilities are Put in Place for the Enhancement of Entrepreneurial Skills (n=80)

S/N	Items	Mean	SD	Remark
1.	There are enough lecturers for proper enhancement of entrepreneurial skills	2.81	0.56	Agree
2.	Most of the lecturers have the requisite knowledge to impact entrepreneurial skills	2.91	0.33	Agree
3.	Successful business experts are invited to teach their business practice to students.	2.62	0.48	Agree
4.	There are professionally trained instructors to teach the course	2.43	0.50	Disagree
5.	There is proper funding of the course	2.33	0.31	Disagree
6.	There are adequate lecture halls for the teaching and learning of entrepreneurship	2.42	0.46	Disagree
7.	ICT services are rendered at the centre for entrepreneurship studies	2.41	0.59	Disagree
8.	Students are exposed to the practical approach of entrepreneurship	2.52	0.53	Agree
9.	There are adequate entrepreneurship textbooks and materials for teaching courses	2.42	0.49	Disagree
10.	There are adequate entrepreneurial laboratories and equipment for acquisition	2.43	0.51	Disagree
	Grand Mean/SD	**2.53**	**0.69**	**Agree**

Table 3 shows the extent to which resource persons are put in place for the enhancement of entrepreneurship skills. As indicated by the responses, items 1, 2, 3 and 8 ranked 2.5 above which indicate that resource persons/facilities were put in place for the enhancement of the entrepreneurial skill while items 4,5,6 7,9 and 10 ranked below 2.5 indicating lack of resource persons/ facilities put in place for the enhancement of entrepreneurship skills. The standard deviation values range from (0.31– 0.59) which indicated that the responses do not deviate widely from the mean.

Discussion of Findings

The findings from research question one showed the various areas in agriculture undergraduates express their preference for entrepreneurship. The responses gathered from Table 1 revealed that students prefer fishery/hatchery and poultry production as areas in entrepreneurship training. This finding agrees with that of Santos et al., (2019) who reported that poultry production is the area most undergraduates expressed their preferences for entrepreneurship in agriculture. Hypothesis was accepted as postulated in Table 2 as not significant.

The responses gathered from Table 2 indicates the extent to which undergraduates have preference for agriculture as an entrepreneurial interest which revealed that students in Delta State University, Abraka have preferences for agriculture as an entrepreneurial interest. The findings affirm the words of Agu et al (2013) that entrepreneurship inculcates in individual's entrepreneurial skills that will enable them confront situations in creative and innovative ways entrepreneurial individuals having also been imparted with employability skills can be employed in other enterprises. They as entrepreneurs, easily become agents of business expansion and growth leading to creation of more business opportunities and more jobs. Hypothesis two was accepted as postulated in the table as not significant meaning that the null hypotheses of no significant difference in the mean responses

of male and female undergraduates on the extent of undergraduates on preferences for entrepreneurship as an entrepreneurial interest are accepted.

The findings of the study on Table 3 showed that to a low extent, resource persons are employed to each entrepreneurship in DELSU, the study also revealed that most lecturers do not possess the requisite knowledge to impart entrepreneurial skills among undergraduates especially in the areas of rabbitary, snailery, flour milling, etc. Hence, in the view of Ikeme (2012) for entrepreneurial skills to be appropriately inculcated in students, experienced resource persons must be put in place to achieve this goal. Agu, *et al.* (2013) affirms that entrepreneurship skills must be nurtured through proper education so that it can be directed to responsible and enriching small business endeavours that will benefit the individuals and the communities which the entrepreneurs live.

Conclusion

From the findings, it can be concluded that undergraduates prefer entrepreneurship in fishery / hatchery and poultry production and that undergraduate's preference to livestock feed production is high because it reduces cost incurred in livestock produce. Furthermore, the extent to which resources persons/facilities are put in place for the enhancement of entrepreneurship skills is on the average therefore, investing in the resource personnels by building their capacity and providing the schools with the prescribed agricultural infrastructures would impact on the undergraduates in entrepreneurship in agriculture.

Recommendations

Based on the findings, the following recommendations were made:

1. The government through the National Universities Commission should set up special grants for frequent training and retraining of lecturers within and outside the country to bring them up-to-date with modern ideas and teaching methods of the subject matter. In other words, appropriate pedagogies should be used in delivering lectures.
2. The government should ensure the adequate provision of comfortable lecture halls and seats that are equipped with requisite teaching and learning aids such as projectors, marker boards, public address system, properly ventilated and well-lit classrooms. Additionally, the government should ensure the provision of information and communication facilities such as a steady internet-access, distribution of laptops and other computer devices to aid learning.
3. The government should also provide adequate skills acquisition machines and equipment to facilitate the empowerment of our teaming youthful population.
4. National Universities Commission should ensure the constant monitoring and evaluation of the activities of stakeholders responsible for the implementation of the goals of government as it pertains to entrepreneurship education. Such relevant stakeholders include lecturers, respective school administrations and other non-academic staff.
5. Specialized textbooks should be published by the Ministry of Education/NUC specifically for entrepreneurship courses in agriculture.

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ADOPTION OF VIRTUAL LEARNING AS 'NEW NORMAL' BY AGRICULTURAL EDUCATION LECTURERS AND LEARNERS IN POST-PANDEMIC ERA IN TERTIARY INSTITUTIONS IN LAGOS STATE

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Abstract
This study assessed the adoption of virtual learning as a 'new normal' by Agricultural Education lecturers and learners in selected tertiary institutions in Lagos-state. The descriptive (Survey) research design was used in this study. The population of the study was 80 Agricultural Education lecturers (22) and final year learners (58) from the Lagos state University of Education (formerly, Adeniran Ogunsanya College of Education and Michael Otedola Primary College of Education in Lagos State. The total sampling technique was used because of the relatively small number of the population. The instrument for data collection was a 15-Item questionnaire constructed on a 4-point scale. The reliability was analyzed using Cronbach Alpha technique which yielded a reliability coefficient of 0.72. The data collected were analyzed using mean and standard deviation to answer the three research questions. The findings revealed that virtual learning resources are being used occasionally by Agricultural Education Lecturers and learners for purposes such as instructional delivery, search engines for researches, administrative work etc. Irregular supply; lack of virtual learning facilities and tools; lack of experts with digital skills etc. were also identified as challenges being faced. It was therefore recommended that; the government should address challenges limiting virtual learning in the tertiary institutions through the provision of stable power supply, provision of adequate facilities for usage by both lecturers and learners also the management of the various educational institutions should ensure that possession of ICT/virtual learning competencies is a major requirement in recruiting prospective lecturers amongst others.

Keywords: Adoption, Virtual Learning, Agricultural Education Lecturers and Learners.

Introduction

The world was hit with the most global epidemic with the outbreak of the corona virus (COVID-19) in late 2019 in Wuhan City in December 2019. The first transmission to humans was in same Wuhan, China (Zhu & Niu, 2020). The disease is commonly transmitted through close contact with infected persons through coughing, sneezing where tiny droplets which may contain the virus enter the mouth or nose of the other person and he or she becomes infected. Hence, the disease is known to spread through tiny droplets (World Health Organization, 2022). Several containment measures to stop the spread of these deadly virus which included a range of physical and social distancing measures were introduced in different countries of the world in order to curb and flatten the epidemiological curve and avert morbidity and mortality due to COVID-19 (Barasa, *et al*., 2020; Viner, *et al*., 2020). Apart from the numerous and varied issues faced by the

world (Olivié & Gracia, 2020), the COVID-19 epidemic has also created a great deal of concern about the direction that globalization will go (Ajami, 2020), particularly with relation to education (Wang, 2020).

These several containments measures, no doubt affected many facets of human life most especially the educational system of the globe. According to United Nations Educational, Scientific and Cultural Organization (UNESCO) (2021) the governments of about 146 countries during the lockdown ordered the closure of educational institutions, thereby throwing about 1.37 billion learners as well as about 60.2 million teachers out of the schools and classrooms spread across the globe during this period. This then led educational institutions and stakeholders to seek alternative means of effective teaching and learning to continue and not create a vacuum which can give rise to a complete collapse of the education sector. According to Basilaia and Kvavadze (2020), educational processes at all levels of education have been affected by the pandemic, causing a reorientation regarding the strategy of transmitting knowledge to students, where the use of ICT has an essential role.

The majority of higher education institutions are now being pushed to either relocate their presences to digital environments or build new digital identities as the winds of change have turned into a storm of change. According to Batty (2018), Datta (2017), and El Saddik (2018), in order to establish a digital presence, a digital twin must be born; in other words, physical campuses are replicating their digital selves. This means that in order to adapt to the changing environment, a number of educational theories must be combined and adjusted. There are a lot of unanswered problems about the concept that virtual campuses are constructed on the concept of digital ecosystems and are essentially digital twins of actual campuses. This made many institutions to resort to the use of Information and Communication Technology (ICT) and adoption of Virtual learning as a panacea to this inculpable effect of the pandemic and this has continued even in the post-pandemic era because physical distancing, including quarantines, isolation are still in place in most countries to curb this menace which is still very much believed to be present. Unfortunately, despite these efforts to set up a supportive remote learning experience by the government, evidence is emerging to show that school closures have resulted in actual learning losses during and after the peak of the pandemic.

Research analyzing these outcomes is ongoing, but early results from Belgium, the Netherlands, Switzerland, and the United Kingdom indicate both learning losses and increases in inequality. Alarmingly, these losses are found to be much higher among students whose parents have less education, a finding reinforced by a study showing that children from socioeconomically advantaged families have received more parental support with their studies during the school closure period. (World Bank, 2022). In Nigeria, during the lockdown, these emerging technologies were also put in use by the different educational institutions and most states started broadcasting educational contents/ instructions through the radio and television learning programme for schools' children (EduCeleb, 2021). The Federal Minister of State for Education also announced that all students in the country were granted free access to e-learning portals such as schoolgate.ng and mobileclassroom.com.ng (Adedigba, 2021).

Later, most of the tertiary institutions developed an Innovative Virtual Learning Platforms. This platform known as Learning Management System (LMS) which was an asynchronous learning system for delivering and managing learning content were used in conjunction with other such as individual school portals, google classroom, YouTube, e-mailing, WhatsApp, teams, telegram, zoom, etc. and this helped to keep the teaching and learning process ongoing during the lockdown and are still in use till date by many institutions. These virtual learning

resources have greatly helped to fulfill substantive functions in the instructional delivery in Agricultural education which is even a more practical oriented course of study and especially under the exceptional conditions arising from the impact of COVID-19, with its virtual applications greatly improving education reaching university students (Mendoza, *et al*., 2020).

According to Bozkurt and Sharma (2020) by offering students greater autonomy, control, and independence and by utilizing instructional technology more skillfully, the goal is to maximize flexibility in the classroom. Alternative techniques for assessment and evaluation are available, and we can take use of e-learning and micro-credentials, encourage virtual student learning as an extension of structured instruction, which would need acknowledging and recognizing earlier. Pegu (2014) also acknowledged that virtual learning helps to deliver education anytime and from anywhere, hence, virtual learning should be the new normal in this post pandemic era in order to curb the spread and avoid a distorted academic calendar as it creates borderless classrooms.

It should be noted that the Virtual form of learning has advanced as a major means of education in the developed world even before the pandemic. It has led to innovations such as virtual field trips and virtual labs to teach required skills through hands-on and experiential learning. This has helped in the continuous teaching of the required skills in Agricultural Education. (Pennisi, 2020). These virtual learning resources therefore delivers both content and practical instruction via communication between lecturers and learners without the need of seeing face to face once there is access to the internet and an intelligent device with connectivity to the internet (Ching & Chan, 2020).

Virtual learning include e-learning which can be conducted by means of electronic media without the use of the internet, blended learning which combines virtual and traditional forms of teaching and learners are able to control the learning process in terms of time, place, tempo, and method of learning; Web-based learning which refers to the use of a web browser for learning; Online learning which can be done through programs or apps installed on your personal device and can also be used online or offline using different devices (e.g., mobile phones, laptops, etc.) with internet access; and Distance learning which is the provision of instruction to a person who is learning in a place and at a time different from that of the teachers and the other learners. In all these environments mentioned above, students can learn in a borderless classroom and be anywhere to learn and interact with instructors and other students conveniently at their own pace (Singh & Thurman, 2019).

We no doubt anticipate negative effects from the great online experiment in the post-COVID world, chief among which will be digital fatigue, a problem that will undoubtedly arise in the near and distant future. Since the world turned to online learning, there have been numerous reports of digital burnout and fatigue (Degges-White, 2020; Sklar, 2020). Some studies also have found virtual learning to be stressful and challenging. (Gupta, *et al*., 2012) For instance, Daumiller, *et al*. (2021) asserted that the performance and work avoidance (e.g., spending the day with little effort) goals were perceived as threats caused by the shift from traditional to online teaching and learning. Scherer, *et al*. (2021) concluded that teachers in higher education are not a homogeneous group, indicating that their innovative potential in education may be a struggle for online teaching and learning. Moreover, Srivastava, *et al*. (2021) claimed that students experienced anxiety issues during the emerging remote learning period.

Additionally, we contend that the crisis may present a chance for a rebirth in instruction gaining knowledge, this piqued our interest in assessing the utilization of virtual learning resources by the Agricultural education lecturers and learners in the post pandemic era and as well identified the

challenges facing its utilization in selected tertiary institutions in Lagos State.

The COVID-19 pandemic is still having a significant impact on the world. While contact tracing and physical distancing—such as lockdowns, isolations, and quarantines—as well as isolation seem to be the most effective measures for preventing the spread of COVID-19 throughout communities, many nations lack the means to adequately prepare for this pandemic. To continue teaching and learning, the majority of nations have turned to virtual classrooms, and these virtual learning materials have been quite beneficial in this regard. The use of virtual learning arose from the need to address the issues with traditional classroom settings, make it easier to continue teaching and learning regardless of time or place, and effectively stop the transmission of illness.

As previously said, Nigeria was placed 62nd out of all countries in terms of institutional virtual learning readiness. This indicates that, given the enormous number of students enrolled in our tertiary institutions, there is a deficiency in infrastructure, inadequate usage, and a lack of virtual learning resources. Therefore, in order to close the gap and take advantage of the wealth of opportunities this technology presents for successful pedagogy, it is necessary to keep an eye on the degree of compliance.

In light of this, this study was conducted to evaluate how instructors and students at particular post-secondary educational institutions are utilizing virtual learning resources. The objectives of this adoption are to determine how often is virtual learning being used; the reasons for adopting virtual learning, and the challenges faced by agricultural education instructors and students to utilize virtual learning resources in the post-pandemic era.

Purpose of the study

The general purpose of this study was to assess the adoption of virtual learning as a 'new normal' by Agricultural Education Lecturers and learners in selected tertiary institutions in Lagos State. Specifically, the study sought to:

i. determine how often virtual learning resources and services are used by the Agricultural Education Lecturers and learners in selected tertiary institutions in Lagos State;
ii. identify the purpose of adoption of virtual learning as a 'new normal' by the Agricultural Education Lecturers and learners in the post pandemic era in selected tertiary institutions in Lagos State; and
iii. identify the challenges associated with the adoption of virtual learning as a 'new normal' by the Agricultural Education Lecturers and learners in the post pandemic era in selected tertiary institutions in Lagos State.

Research Questions

The following research questions were answered in the study.

1. How often is the use of virtual learning as a 'new normal' by the Agricultural Education Lecturers and learners in the post pandemic era in selected tertiary institutions in Lagos-State?
2. What are the purposes of adoption of virtual learning resources by the Agricultural Education Lecturers and learners in the post pandemic era in selected tertiary institutions in Lagos-State?
3. What are the challenges associated with the adoption of virtual learning as a 'new normal' by the Agricultural Education Lecturers and learners in selected tertiary institutions in Lagos State?

Methodology

Descriptive (Survey) research design was used in this study. The population of the study was 80 Agricultural Education lecturers (22) and final year students (58) from the Adeniran Ogunsanya College of Education and Michael Otedola Primary College of Education in Lagos State. No sampling was done because of the relatively small number of the population. The instrument for data

collection was a questionnaire. The instrument for data collection is a 15-item questionnaire constructed on a 4-point rating scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). This has three sections based on the research questions. The questionnaire was validated by two lecturers each from two selected Colleges of Education. (Two Agricultural Education lecturers and two Computer Education lecturers) and their suggestions were included in the questionnaire. To ascertain the reliability of the questionnaires, 20 copies were administered to Agricultural Education lecturers from Federal College of Education, Osiele, Ogun State. Data were collected and analyzed using Cronbach Alpha technique which yielded a reliability coefficient of 0.72. The questionnaires were administered by two research assistants. The data collected were analyzed using mean and standard deviation to answer the three research questions. Any item with mean ratings of 2.50 and above were adjudged to be 'Agree' with and below 2.50 were regarded as 'Disagree' with.

Results

The results are presented sequentially based on research questions below.

Research Question 1

How often is the use of virtual learning as a 'new normal' by the Agricultural Education Lecturers and learners in the post pandemic era in selected tertiary institutions in Lagos-State?

Table 1

Mean Response of Agricultural Education Lecturers and Learners on the Frequency in the Utilization of Virtual Learning Resources by the Lecturers and Learners in the Post Pandemic Era

S/N	Items	Mean ($\bar{x}$)	SD	Decision
1	Daily	2.15	0.98	Disagreed
2	Occasionally	3.65	0.56	Agreed
3	Seldom	2.35	1.11	Disagreed
4	Never	2.18	1.04	Disagreed

Table 1 shows that item statements 1, 3 and 4 had their mean ratings ranging from 2.15-2.53 which were below the cut-off point of 2.50 hence it revealed that the respondents disagreed with item statements 1, 3 and 4. However, the respondents agreed to item statement 2 which had the mean rating of 3.65 which is above the cut-off point. The data also revealed that the standard deviation of the respondents ranges between 0.56-1.11 indicating that the responses of the respondents were not too far from the mean and each other.

Research Question 2

What are the purposes for the utilization of Virtual learning resources by the Agricultural Education Lecturers and learners in the post pandemic era in selected tertiary institutions in Lagos-State?

Table 2
Mean Response of Agricultural Education Lecturers and Learners on Purposes of Utilization of Virtual Learning Resources

S/N	Items	Mean ($\bar{x}$)	SD	Decision
5	Instructional delivery, assignments, quizzes	3.25	0.82	Agreed
6	Search engines and research work	3.41	0.82	Agreed
7	Administrative work (virtual meetings, trainings, etc.)	3.00	0.83	Agreed
8	Virtual field trips, Practical classes	2.18	1.04	Disagreed
9	Online databases instructors.	2.47	1.14	Disagreed
10	Conferences, Seminars	2.91	0.97	Agreed

Table 2 revealed that the respondents agreed to the item statements 5, 6, 7 and 9 as the mean ratings ranges from 3.00-3.41 which were above the cut-off point of 2.50 while they disagreed with item statements 8 and 9 which had the mean ratings ranging from 2.18-2.47 which were below the cut-off point. The data also revealed that the standard deviation of the respondents ranges between 0.82-1.14 indicating that the responses of the respondents were not too far from the mean and each other.

Research Question 3
What are the challenges in utilizing of virtual learning resources by the Agricultural Education Lecturers and learners in the post pandemic era in selected tertiary institutions in Lagos State?

Table 3
Mean Response of Agricultural Education Lecturers and Learners on the Challenges Associated with the Utilization of Virtual Learning

S/N	Items	Mean ($\bar{x}$)	SD	Decision
11	Irregular power supply	3.46	0.68	Agreed
12	Lack of/limited access to digital facilities and tools	3.48	0.79	Agreed
13	Lack of experts in digital skills of learners	3.34	0.72	Agreed
14	Poor internet infrastructures and access problem	3.40	0.73	Agreed
15	Lack of appropriate guidelines on virtual learning	2.85	1.03	Agreed

Table 3 revealed that all the respondents agreed to all the item statements as the mean ratings ranged from 2.85-3.48 which were all above the cut-off point of 2.50. The data also revealed that the standard deviation of the respondents ranges between 0.68-1.03 indicating that the responses of the respondents were not too far from the mean and each other.

Discussions of Findings

Results in Table 1 shows the major finding of the study on the extent that Agricultural Education Lecturers and learners frequently utilize virtual learning resources in the post pandemic era and this revealed that they occasionally utilize virtual learning resources. This is supported by Goldschmidt (2020) who posited that dependency on virtual learning increased especially in higher education. This is also in line with the study of Hodges, *et al.* (2020) who posited that the emergence of the COVID-19 pandemic has required educators and students across all levels of education to adapt quickly to virtual courses. The findings by Hodges, *et al.* (2020) also revealed that virtual learning resources in tertiary institutions were not utilized every day. Toto and Limone (2021) also found out that some school teachers were reluctant to use digital technologies owing to lack of skills in using digital technologies in education. Similarly, a survey of academics from 91 countries revealed a 51% variance in the role of the instructor's demographics and professional

competence in adapting to virtual learning technologies.

Results in Table 2 shows the major findings of the study on the purposes of utilization of virtual learning resources by Agricultural Education lecturers and learners and this revealed that virtual learning is utilized for instructional delivery, search engines for research work, administrative work and for hosting conferences/seminars. This is supported by the report of the University of British Columbia (2020) which has recently used different methods, such as blended learning, Massive Open Online Courses (MOOCs) and experiential learning, to offer more opportunities for learners to control their own learning process and improve their learning experiences. This is also in line with the study of Furton (2020) who said Synchronous online conferencing systems, such as Zoom and Google Meet, have allowed experts from anywhere in the world to join online classrooms and have allowed presentations to be recorded for individual learners to watch at a time most convenient for them. The findings also revealed that virtual learning is not utilized for Virtual field trips/ practical classes even though Pennisi (2020) emphasized that the importance of hands-on, experiential learning has led to such innovations.

The results in Table 3 shows the major finding of the study on the Challenges of using virtual learning resources and it revealed that irregular power supply, lack of/limited access to VLR facilities and tools, lack of experts in digital skills; Poor internet infrastructures and access problem and Lack of appropriate guidelines on virtual learning were all identified as challenges in the utilization of virtual learning by Agricultural Education lecturers and learners. The study of Oyediran and Dick (2018) who both explained that the power supply in Nigeria is erratic and worrisome to the public as its supply is diminishing and getting worse in line with this finding on irregular power. Likewise, on lack of/limited access to VLR facilities and tools, this is supported by Adeoye, *et al.* (2020) who reported that the price of computer hardware and software is several times more expensive in Nigeria than in advanced countries. On Lack of experts with digital skills to train the lecturers and learners, Eze, *et al.* (2018) study is in line with this finding as they argued that lack of experts in ICT affects its use in Nigeria. On the slow speed of the internet, Mahmood (2020) and Ali (2020) reported that poor state of infrastructure and manpower development affects the efficient use of the internet and consequently affects the utilization of VLR by Agricultural Education lecturers and learners.

Conclusion

On the basis of the research questions raised for the study by the authors, it was concluded that virtual learning resources are being used occasionally by Agricultural Education Lecturers and learners for purposes such as instructional delivery, search engines for research works, administrative work etc. like their counterparts globally. It also revealed that innovations such as Virtual field trips and virtual labs are yet to fully utilize by the Agricultural education lecturers and this helps a lot in the teaching of the practical aspect of Agriculture. The findings also identified some challenges faced in the utilization of VLR as irregular supply; lack of VLR facilities and tools; lack of experts with digital skills etc. No doubt if these identified challenges can be overcome, it will position virtual learning to become a key tool in education that can revolutionize the instructional and learning process in the post pandemic era.

Recommendations

Based on the findings of the study, the researchers made the following recommendations:

1. The three tiers of government should as a matter of urgency address challenges limiting the adoption of virtual learning in the tertiary institutions by ensuring regular electricity supply, funding adequately the ICT needs of all tertiary

institutions amongst others.

2. The management of the various educational institutions should ensure that possession of ICT/virtual learning competencies is a major requirement in recruiting prospective lecturers and continue to sponsor them to seminars and conferences to remain up-to-date and upgrade their ICT/virtual learning competencies.
3. The different curriculum development bodies review the existing curriculum to specify the quantity and quality of modern virtual learning resources that should be provided for effective instructional delivery in the different programme of studies in our educational institutions.

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THE IMPERATIVES OF CROP PRODUCTION IN NIGERIA FOR SUSTAINABLE FOOD SECURITY

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Abstract
Self-sufficiency and sustainability have always been the goal of Nigeria in food production especially in food crops. The recent dynamics of weather, insurgency, communal clashes and terrorism have created a lacuna in not only cultivation of crops but also in harvesting. Many farms have been abandoned. This paper examined the needed direction for access, availability and sustainability of food via crop production in Nigeria.

Keywords: Crop production, sustainability, self-sufficiency, food security

Introduction

Crops are plants varieties that have been selected by man based on characteristics and characterized function. These plants principally provide man with a variety of usage ranging from food, medicine and the processing of their products further provides other materials needed for comfort. Selected plants (crops) are cultivated with the intention of harvesting them whole or specific parts of their body at certain time in their life cycle; hence classified using the harvested parts such as stem crops (sugar cane), leafy crops (vegetables) and root crops (cassava) and fruit crops (pawpaw, mango, and pea) (Egun, 1994; Egun, 1999).

Food production has been the basic deliberate activity of man. The role of food in the life of man cannot be overemphasized as it provides the energy required for living and other activities of the body system. Increase in population has long brought pressure on food demand as the predominant subsistence farming no longer suffices. There is therefore need for the cultivation of larger expanse of land, feeding of developing industries that are agro-based. This has led to the science of agriculture to adopt many measures aimed at increasing the yield of crops and in some cases reducing the growing period of a desired plant, thus enabling it to be grown two or three times within the cultivable season. Some crops have also undergone genetic modification to increase yield and accompanying disease and pest resistance, all with the aim of ensuring food availability. To increase crop production, various programmes were launched at different times. Such programmes include Operation Feed the Nation (OFN), Green Revolution, River Basin Development Authority, National Agricultural Food Production Programme (NAFPP) and most recently Anchor Borrowers Programme of Central Bank to boost the cultivation of such crops as maize, rice, wheat, sorghum, and millet. All these efforts are majorly to achieve self-sufficiency in food production and thus ensures food security.

Food consumption is a necessity of all living organisms. Most food substances come from plants especially Nigeria. Food has given concern to issues such as famine, hunger, communal clashes in developing countries and currently malnutrition. Many scholars have expressed concern about crop production (Inoni, 2019; Ojeifo, 2017; Maydona & Omoyola, 2005).

Crops and their cultivation are influenced by many factors which include moisture stress that may result from droughts leading to stunting in growth and reduced

yield based on the intensity. Change in climate influences crop production (Inter-governmental Panel on Climate Change (IPCC), 2007) mostly the proliferation of diseases and pests. Mayowa and Omoyola (2005) noted that most disasters (flood, drought, desertification land degradation are consequences of climate change and greatly affect crop production. The implication of this phenomena is reduction in crop yield and animal production which constitutes man's food. According to Inoni (2019), food security is a complex situation and so are the drivers of the emergence and persistence at the national, household and individual levels in Nigeria. The climate variables of temperature, rainfall, sunshine and humidity affect agriculture production positively and negatively (Okoh, 2015) and a departure from the plant acceptable level set in physiological changes in the plant which can lead to reduction in yield.

Challenges to Crop Production and Food Security

1. Herdsmen: In the recent times, the activities of herdsmen have contributed to food insecurity especially in the Sahel areas of the country. These men armed with sophisticated weapons invade farms killing farmers and grazing animals on cultivated crops. Consequently, farmers are afraid to attend to their farms and even harvest matured crops. Many farmers have lost their lives in various attacks by the herdsmen. Many crops are grazed before they attain maturity; thus, endangering future supply of food.
2. Pests and Diseases in various localities have increased in number and spread as a result of climate change. Insects and animals are growing in the wild – mouse, giant rats, birds (patridges inclusive) and monkeys. Climate change has affected the natural ecology of these pests and subsequently seen now in areas where they were previously not thriving. Pests are also known as agents of disease causal organisms and vectors.

   Diseases have been recorded in new places, especially crop diseases that thrive in humid environment mostly fungal types that are either water or wind borne affecting the grains, tree crops and tuber crops.

   Flooding has become an annual occurrence. Flood wash off cultivated crops and when of high intensity devastate farmlands including homes of farming communities. In some cases, farms in the valleys are submerged thereby making harvesting an impossible task.
3. Communal conflicts in Nigeria have taken a toll on food insecurity. In recent times, many communities have been having conflicts with their neighbours, resulting from disagreement over land boundaries. In Nigeria, Benue and Plateau States have recorded series of conflicts leading to loss of lives and abandonment of farm by their respective farmers, thus creating food insecurity.
4. Insurgency and kidnapping have become common occurrence in Nigeria. These factors have since threatened farming communities and crop production. Many farmers have since abandoned their farms for safety and relocated as refugees where farming activities are not generally feasible, thereby contributing to food insecurity. Tied to this is food distribution. Many vehicles loaded with food materials have been reported to have been intercepted and set ablaze by bandits.

   The school system: The teaching of agriculture in schools has not been effective. Although the National Policy on Education (FGN, 2014) defined what school agriculture should achieve, the translation to practical reality is yet to be achieved due to myriads of problems (Egun, 2021; Egun, 2002 & Egbule, 2012).
5. Cultural bias of land inheritance against women. Women, constitute 49% of Nigeria population (Country Meters, 2023). This percentage of persons strive

under share cropping on the small holder basis. The percentage calls for critical utilization of science technology in crop production especially in the cultivation of arable crops which constitute major source of food in the nation.

Way Forward

A very good percentage of Nigeria population lies in the youths, who are still in school. These youths need to be taught modern farming methods and developments in Agriculture both in school and native environment using curriculum that is home grown and rooted in culture (Egun, 1999) mostly as Etuk (1991) has long observed that both students and teachers will generally return to the land. The goal set for Agriculture in school is too general that individuals finish from school being so elitist. Agriculture should be vocationalized into trades whereby persons can be specialists in agricultural trades.

Herdsmen menace and kidnapping requires state actors' involvement. Government should as a matter of necessity employ and deploy security agents to ensure the security of farmers.

Climate change has led to flooding in many parts of the country with devastating effects. Control of climate is not within reach but the effects could be harnessed for sustainable crop production. Nigeria has a vast arable but arid land space; especially in the Sahel region. The flood resulting from climate change can be harnessed through channeling for irrigation. Irrigating the dry areas of the Sahel region favourable for the cultivation of the arables, such as rice, sorghum, maize, guinea corn and tomatoes will increase the supply and cultivation of these crops especially so they could be grown about two or three times in a year or growing season.

Farmer education through extension service should be intensified to embrace both in-school and out-of-school farmers. Modern technology needs to be spread among the populace especially women that constitute about 49.5% (Country Meters, 2023) of the population. Farmers should be encouraged in the use of scientific method of pest and disease control. They are known to have lost a good percentage of their crops as a result of wrong application of chemicals especially weedicides (herbicides). Effective education will enable farmers understand the off-season or close season of crops, application of chemicals and prevent post-harvest loses. Education of farmers should include addition of value to products. This will increase income and attract youths to farming as all food processing stage increase income and make a variety of food available and within the reach of the people.

Loan should be granted to farmers by government without interest. The Anchor Borrower Programme schedule should be encouraged to enable both adults and young farmer cultivate large areas of land either on individual basis or partnership. This will increase expanse of land coverage and use of agricultural machines.

Transformation of Agricultural Produce

Agricultural crops produce are harvested most times in perishable state. That is, they have a very significant short shelf life. Consequently, they have need to be transformed into products that will store for a longer period through the addition of one value or the other based on nutritional recommended standards. Harvested tuber of cassava goes putrid within few days; same applies to tomatoes, oranges and the vegetables; the grains may not be exempted. There is need therefore to transform them into other products without loss of nutritive value or enriched into food additives as preservative for longer shelf-life; thus, ensuring accessibility during off season at affordable price.

Conclusion

Food challenges have been a worldwide phenomenon which Nigeria is not an exemption. A country is said to be food secured when her nationals can have good access, the purchasing power and availability at all times. In Nigeria, the definition of food

security as posited by Simon (2012) and FAO (2015) do not apply; resulting from myriads of challenges ranging from the menace of armed herdsmen, flood, pest and disease among others. Therefore, the following predicated on some identified challenges are recommended: farmer education in crop production, upscaling of security by state actors, redesigning of school agriculture, channeling of flood water for irrigation purposes among others.

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ENHANCING WOMEN PARTICIPATION IN AGRICULTURAL ACTIVITIES FOR ACHIEVING FOOD SECURITY AND POVERTY REDUCTION IN UMUAHIA NORTH LOCAL GOVERNMENT AREA

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Abstract
This paper was focused on enhancing women participation in agricultural activities for achieving food security and poverty reduction in Umuahia North Local Government Area. Women have contributed substantially in terms of labour supply and food production. The paper discussed the concepts of poverty, challenges of women in agriculture, enhancing women participation in agricultural activities for achieving food security and poverty reduction because they have contributed in labour supply and output of crops and livestock. The paper recommended that government should encourage and assist women farmers by giving them special attention in terms of access to needed farm inputs. Incentives and credit facilities should also be provided through various women groups and cooperative societies so as to enable them participate fully in agricultural activities.

Keywords: Women participation, Agricultural activity, poverty reduction, food security

Introduction

Women are very important in Agriculture. In Nigeria, where the economy is still predominantly agrarian, women are key players in this business of agriculture especially within rural communities (Nzeakor & Ukoha, 2020). They help in solving hunger and food insecurity problems in every possible way by participating in the activity of food production, processing and marketing of farm produce (Asogwa, *et al.*, 2020). More so, women are inarguably resourceful and innovative and are a force to reckon with in terms of labour supply because they make up more than 50 percent of Nigerian population and have been reported to contribute about 68.8 percent of the agricultural labour and produce about 80 percent of the Nigerian food output. Women have also contributed substantially to Gross Domestic Product (GDP) and employment of labour in the country and have been regarded as an important human resource of the nation as well as mediators of economic growth and development (Nzeakor & Ukoha, 2020).

The role of women in enhancing food security, reducing poverty, positioning and meeting of the inherent challenges of agricultural businesses in Nigeria are enormous. They contribute between 40 and 65% of all hours spent in agricultural production and processing and also undertake 60 to 90% of the rural agricultural product marketing, thus providing more than two thirds of the workforce in agriculture (Agbalajobi, 2020). In Abia State and Umuahia North Local Government Area in particular, women have worked so hard in producing significant number of agricultural crops, tending animals, processing and preparing food, working for wages in agricultural or other rural enterprises, collecting fuel and water and engaging in marketing of agricultural produce (Asogwa, *et al*., 2020).

This paper is presented under these sub-headings; concept of food security, poverty, challenges facing women in agricultural activities for achieving food security and poverty reduction and conclusion.

Concept of Food Security

The term "food security" is an important phenomenon with a global recognition. It was first discovered as a concept of food supply in which at that time, food crisis led to concerns that global food supply shortages might bring about political instability. It could also be defined as when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and for food preference for an active and healthy life. It was recognized at that time that food availability remained a fundamental component of comprehending what food security meant, and it was realized that food availability was not a sufficient condition for access to food at household level (Idris, *et al.*, 2020).

Food security further evolved as a concept that did not include only national levels but also involved household and individual distributions. This food access at household levels continued to gain relevance with the understanding that household is a key social unit through which people access their food (Ike, *et al.*, 2015). Also, food utilization was recognized as a third component of food security, which reflects differences in the allocation of food within the households, the national quality of food and variation in absorption and metabolism of food nutrients by individuals within the household.

Food insecurity and its derivatives are used as economic development indicators because of the positive linear correlation that exists between the two (Otekunrin, *et al.*, 2019); this informs its prominent mention in the Sustainable Development Goals (SDGs). Examples of food security-related indicators of development include but not limited to:

i. prevalence of stunting and wasting of under-age children;
ii. under-five years children mortality rate;
iii. infant mortality rate;
iv. maternal mortality rate; and
v. proportion of total water resources used.

For Nigeria to develop, food security growth must be sustained. An increase in production activities in the industrial, mining, metallurgy sub-sector, especially if it promotes export (like the case of Nigeria being a net exporter of urea) must, without doubt, put food on the table of average Nigeria. No economy can thrive sustainably without improving the human capital component of the economy (Ayinde, 2019). Food insecurity negatively affects human physical, social, emotional, and cognitive development throughout the life course and is a major social and environmental disruptor with serious repercussions for planetary health (i.e., the health of human civilization and the state of the natural systems on which it depends). Food security is related to all of the United Nations SDGs. Improved food security governance based on sound, sustainable and equitable agriculture is essential for countries to meet the SDGs (Perez-Escamilla, 2017).

Food and nutrition security embraces meeting energy, protein and nutrient needs for healthy life. Food systems overlap with agricultural systems in the area of food production, but also comprise the diverse set of institutions, technologies and practices that govern the way food is marketed, processed, transported, accessed and consumed. The food system activities are grouped into four categories: producing food, processing and packaging food, distributing and retailing food, and consuming food (Adekunle, 2021).

Concept of Poverty

The word poverty comes from the old (Norman) French word poverté (Modern French: pauvreté), from Latin paupertās from pauper (poor) (Ahmed and Maitra, 2020). There are several definitions of poverty depending on the context of the situation it is placed in, and usually references a state or condition in which a person or community lacks the financial resources and essentials for a certain standard of living. According to United Nations poverty is a denial of choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family,

not having a school or clinic to go to, not having the land on which to grow one's food or a job to earn one's living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living in marginal or fragile environments, without access to clean water or sanitation (Dvorak, 2015).

According to World Bank, poverty is pronounced deprivation in well-being, and comprises many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of voice and insufficient capacity and opportunity to better one's life (Simcock *et al.,* 2017). According to European Union (EU) poverty is significantly different from definitions in other parts of the world, and consequently policy measures introduced to combat poverty in EU countries also differ from measures in other nations. Poverty is measured in relation to the distribution of income in each member country using relative income poverty lines. Relative-income poverty rates in the EU are compiled by the Eurostat, in charge of coordinating, gathering, and disseminating member country statistics using European Union Survey of Income and Living Conditions (Dvorak, 2015).

Poverty can have diverse social, economic, and political causes and effects. When evaluating poverty in statistics or economics there are two main measures: *absolute and relative poverty*. Absolute poverty compares income against the amount needed to meet basic personal needs, such as food, clothing, and shelter. *Relative poverty* measures when a person cannot meet a minimum level of living standards, compared to others in the same time and place (United Nation, 2020). The definition of *relative poverty* varies from one country to another, or from one society to another. Statistically, as of 2019, most of the world's population live in poverty: in dollars, 85% of people live on less than $30 per day, two-thirds live on less than $10 per day, and 10% live on less than $1.90 per day now changed to $2.15/day (extreme poverty). According to the World Bank Group in 2020, more than 40% of the poor live in conflict-affected countries. Even when countries experience economic development, the poorest citizens of middle-income countries frequently do not gain an adequate share of their countries' increased wealth to leave poverty (United Nations [UN], 2020).

Challenges of Women in Agriculture

In Nigeria and Umuahia North Local Government Area in particular, women play important role in achieving food security and poverty reduction, but there are many challenges constraining women in agriculture. These include the following: Limited access to land, limited access to capital and credit, limited access to agricultural input, limited access to education and limited access to appropriate technologies.

i. **Limited Access to land:** In most parts of Nigeria, women had restricted access to land due to cultural, traditional and sociological barriers Butt (2020). observed that constraints reduced their potentials by 20%. Although women were the mainstay of viable agro-ecological system, yet they were refused titles over land. FAO (2020) pointed out that the control of land conferred on the owner access to both credit, and inputs such as extension services, seeds, farming technologies and membership to farmers' co-operative societies.
ii. **Limited Access to Credit:** Women generally in agriculture need credit incentives to purchase equipment and other agro inputs. Ubah and Oketoobo (2019) observed that women do not have fair share of their husband land ownership, they are denied credit access from the lending institutions for want of collateral.

iii. **Limited Access to Agricultural Inputs:** Women farmers are not frequently reached by extension services because they are rarely members of co-operative societies which the government recognized as the only organ of trust for distribution on inputs and subsidies.

iv. **Limited Access to Education:** Education is a veritable instrument against ignorance. It can bring about changes in the increased rate of adoption of modern farming systems and technologies. Emmanuel (2018) reported that l,000 million illiterates in the world were women and only 5% of extension services were addressed to women. Butt (2020) concluded that farm productivity would increase to 8.7% if a farmer had primary education. FAO (2020) indicated that if women are educated at primary level their output would increase by 24%.

Enhancing Women Participation in Agricultural Activities for Achieving Food Security and Poverty Reduction

This can be achieved by:

i. Provision of technical assistance to women through the technical assistance trust fund. Technical assistance is critical for all of the cross-cutting themes growing the number of agribusiness entrepreneurs, supporting equitable remuneration of women and developing women-themed products (Fabiyi, *et al*., 2019). An example of the support technical assistance can provide to women agribusiness entrepreneurs is increasing access to inputs and best practices. For example, in arable crop farming, this could mean facilitating the adoption of chemical and fertiliser best practices and developing nurseries to supply farmers with improved varieties. Technical assistance can also support women through training opportunities to improve productivity (Ayogu & Agu, 2015). Training courses should be set up thoughtfully to ensure they provide a meaningful opportunity that women can take advantage of (the training schedule and accommodate women's domestic chores and duties). The training should be a tailored offering that covers the technical requirements of the most relevant portions of the value chain (e.g., farming, processing, marketing, packaging and trading) and basic financial management and business skills, as appropriate. In addition to training, technical assistance can take the form of women-inclusive cooperative programmes that establish women as co-owners. Training is also essential for increasing access to niche markets through the production and marketing of products from women-led value chains (Obinna & Ukoha, 2017).

ii. Provision of financial assistance. Providing finances for women entrepreneurs is relevant for all of the cross-cutting themes—growing the number of large-scale agribusiness entrepreneurs, supporting equitable remuneration of women and developing products from women-led value chains. Financing options are also critical to supporting women entrepreneurs in large-scale agribusiness. In plantation agriculture which has a long growth period, this could take the form of funding through loans collateralized against production or that otherwise accommodate the extended growing periods of the crops. Financing options for women include loans guaranteed against future earnings from agricultural products, with little or no collateral required (Odoemelam, *et al*., 2016).

Providing finances to members of women-inclusive cooperatives can be used to establish and support women as co-owners. This would allow women to get better access to inputs and machinery which would, in turn, improve productivity. African Development Bank (AFDB) could partner with agricultural development finance institutions (e.g., Bank of Agriculture in Nigeria), by providing them with technical advisory

on their lending practices to women (Ukoha & Okonkwo, 2017).

iii. Establishing market links for women through the private sector. This is most relevant for increasing the number of women entrepreneurs in agribusiness and for developing products branded as coming from women-led value chains. Global market links are critical for agribusiness entrepreneurs to tap into new markets and expand into large scale enterprises and then benefit from economies of scale (Ukoha & Okonkwo, 2019).

Market links are also pivotal in order to develop products branded as coming from women-led value chains, as niche markets are willing to pay a premium for these products (e.g., artisanal women-branded chocolate from Côte d'Ivoire) are largely international. Establishing these links early is crucial to ensure that the quality and phytosanitary standards required for export are built into the business. In order to take advantage of global market links, the supply chain must be able to support the export of goods. To ensure this, small producers must be linked to industrial-scale processors, and these processors must then be linked to large retailers. Women should be involved in each of these links.

Conclusion

This paper discussed enhancing women participation in agricultural activities for achieving food security and poverty reduction in Umuahia North Local Government Area. The paper revealed that women are agents of change and veritable tools for food security and poverty reduction. They have contributed substantially in terms of labour supply and output of crops and livestock. The challenges of women participation in agriculture include: Limited access to land, access to credit, access to agricultural inputs, access to education among others. Ways of enhancing women participation in agricultural activities for achieving food security and poverty reduction include: provision of technical assistance to women through the technical assistance trust fund. Provision of financial assistance to women. Providing financing for women entrepreneurs is relevant for all of the cross-cutting establishing market links for women through the private sector.

Recommendations

The following recommendations have been proffered:

i. Government should encourage and assist women farmers by giving them special attention in terms of access to needed farm inputs and incentives.
ii. Women adult literacy education programme is required to help women farmers acquire basic skills and abilities to seek and receive agricultural information through extension agents. This will make them to participate more in reading extension leaflets, bulletin and newsletter.
iii. Credit facilities should be provided by the government either through various women group and cooperative societies so as to enable them participate fully in agricultural activities.

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MANAGEMENT SKILLS REQUIRED BY GRADUATES OF AGRICULTURE FOR SUSTAINABLE POULTRY PRODUCTION IN SOUTH-WEST ZONE, NIGERIA

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Abstract
The study identified the management skills required for sustainable poultry production by agricultural graduates in Nigeria's South-West Zone. This study employed a survey research design. The study's population consists of 345 subjects from selected poultry farmers in Nigeria's southwest zone, which includes six (6) states: Ogun, Oyo, Osun, Lagos, Ondo, and Ekiti. A multistage sampling technique was used to select three southwest states (Ogun, Oyo, and Osun). Out of the nine (9) universities of education that offer Agricultural Science as a course in the south-west zone of Nigeria, which encompasses federal, state, and private universities in each state, they were purposively selected based on the graduate population. A purposive sampling technique was employed to select five (5) lecturers from each of the selected universities, giving a total of 45 (forty-five) respondents. Twelve weeks were used for the study. The study's collected data were analyzed using SPSS 26. The findings showed that raising poultry is financially viable and might help people become more self-sufficient and less reliant on government handouts. Poultry producers are often small-holder farmers with a low rate of resource utilization due to the research area's enterprises' financial constraints. Farmers should follow the established vaccination schedules for the birds (poultry) and practice good cleanliness to prevent disease outbreaks, and the government should help them get financing if necessary.

Keywords: Management skills, sustainable, poultry, graduates and agriculture

Introduction

Entrepreneurs are the bedrock of the Nigerian economy. According to data from the National Bureau of Statistics (NBS) (2022), micro, small, and medium enterprises (MSMEs) account for 49.8% of Nigeria's gross domestic product (GDP) and constitute a significant share of the total number of businesses in Nigeria. In terms of the labor force, they account for about 85% of total industrial employment and are distributed across all sectors of the economy. These businesses have been instrumental in providing creative solutions, innovative ideas, and value creation in the sectors where they operate (Ofili, 2014). The number of startups in Nigeria was estimated to have exceeded 3,360 in 2022, the highest number in Africa. Following that, Kenya and South Africa counted approximately 1,000 and over 660 startups in the same year, respectively. Other key African markets for startups were Ghana, Morocco, Tunisia, and Rwanda (Quartz, 2021; 2022).

Entrepreneurship is not an easy road; although some organizations emerge and develop, many others arise and quickly disappear from the market (Lumpkin & Gregorg, 2010). The skills acquired by agricultural education graduates are enough to enable them to excel in any marketing opportunity. Agricultural education is a vocational education programme that provides skills and competence for teaching in areas of agriculture for self-reliance. To support the definition, the National Board for Technical Education (1987) believes that agricultural education revolves around job skills, employability, and self-dependency. Agricultural education is a course that is very practical and comprehensive in nature.

According to Ekong and Ekong (2016), unemployment is one of the developmental problems that affect every developing economy, including Nigeria in this current situation. Many agricultural

education graduates in south-western Nigeria, who are very active and willing to contribute their quota to the economic and political development of the state and the country at large, cannot do so due to a lack of entrepreneurial skills required in poultry production (Puis, *et al*., 2021). The issue of unemployment is one that can be effectively tackled and subdued if agricultural education graduates are willing to embrace skills acquisition in agricultural sustainability through entrepreneurship education in poultry production (Backyard Poultry Production Systems, BPS, 2020).

Poultry production in Africa is progressively increasing as global demand for chicken meat and eggs rises at an exponential rate. The total revenue from production and exports of chicken meat was estimated at US$11.4 billion in 2018 (Pius et al., 2021). This increased by 6.1% from the previous year. As such, the market value progressively increased by an average of 1.8% per year between 2013 and 2018. Africa's chicken meat market may steadily grow to 11 million metric tonnes by 2030. Lucrative poultry business opportunities include egg production, meat production, chick incubation, and processed chicken meat products.

According to Nkukwana (2018), Africa's poultry business is fast growing due to the continent's rising population and socioeconomic expansion, as Africans source their animal protein from chickens and eggs. Despite the poultry industry boom, chicken production in the United States has remained low compared to other regions of the world (Gržinić, *et al*., 2023). Grzinic, *et al.* (2023) observed that Africa produces only 4% of the world's chicken and poultry products. Thus, there is a need to enhance Africa's poultry production to match the rising consumption rates. This is because the African continent imports poultry on a regular basis. For example, between 2001 and 2021, poultry imports expanded from 0.33 million metric tonnes to 1.96 million. Unfortunately, this trend is envisaged to increase to approximately 2.54 million metric tonnes annually by 2031 (New Partnership for Africa's Development - NEPAD, 2022). South Africa, Ghana, and Angola account for more than half of the region's chicken imports (Berkhout, 2021).

Poultry production has grown worldwide, ranging from simple backyard cages to highly sophisticated and advanced production systems backed up with advanced technological facilities at all stages of production, especially breeding and processing (Okwelle & Owo, 2018). Modern poultry production nationwide requires some technical and saleable skills to succeed in a sophisticated network of enterprises that ranges from farm establishments, feed milling, storage, and delivery, hatcheries, breeding programmes and their facilities, poultry rearing, slaughtering plants, and other processing and marketing facilities (Gates & Overhaults, 2019). However, meat-purpose poultry production has gained more patronage than other forms of poultry, making poultry an enterprise of interest among small, medium, and large-scale agricultural business operators (BPS, 2020).

Skills, according to Isiwu (2019), are described as special talents and abilities developed by an individual to execute tasks in a uniquely impressive manner, which are acquired through quality education, training, and experience. In the same vein, Samuel (2017) argues that skill refers to any special abilities in a given occupation that are developed through learning and practice. Furthermore, Ogbuanya and Bakari (2014) posit that skill refers to an individual's capacity to control elements of behaviour, thinking, and feeling within specified contexts and within a particular task domain in order to excellently execute tasks. Hence, acquiring skills in vocational agriculture for agricultural sustainability is key to achieving success in such vocational careers (Okwelle & Owo, 2018). Experts in planning (what to do, how to do it, when to do it, and where to do it), establishing, management, farm level, and marketing frozen chicken are those individuals who already possess operational skills, while students in the school are

required to equip themselves and attain some basic skills in order to be employed and sustainable in the poultry industry.

Coombs (2017) states that effective skill acquisition increases productivity in any agricultural business or career choice. Entrepreneurial skill acquisition in poultry production leads to increased productivity (Nwaobiala, *et al*., 2016). Thus, with adequate entrepreneurship development obtainable via education and training, the Nigerian Agricultural Education graduates, especially those residing in rural areas, can do excellently in poultry farming, thereby securing their future through sustainable revenue generation. Deficiencies in poultry production skills among recent agricultural education graduates who may plan to gain entry into these occupations now or later (Okwelle & Owo, 2018).

In the larger context of sustainable poultry production, improving production has been a widely explored topic in light of heavily industrialized conventional methods (Samuel, 2017). While it is common to hear arguments centred on livestock production being wholly unethical, sustainability seeks a more moderate solution. The goal is to cultivate practices that reflect nature's natural processes and include fauna (Mann & Sherren, 2018) in a more comprehensive way. To achieve this, more skills need to be integrated into the approach than the elimination of livestock production, which is critical. One key value brought by these methods over conventional or crop-only systems is the replication of natural grazing that facilitates nutrient cycling within the ecosystem (Vaarst, *et al*., 2015). Additionally, research has shown that skill acquisition in integrated livestock systems offers numerous benefits with regard to the restoration of degraded land, worker health, and improved animal welfare (Fernandes, *et al.*, 2021). Such systems are a worthy goal for any program seeking to emulate the highest principles of sustainable agriculture development.

Livestock productivity in Nigeria is low, and this has negative implications for the economy (Vaarst, *et al*., 2015). For instance, the country is unable to meet its domestic demand and has had to rely on the illegal importation of 70% of its poultry needs. The difference between domestic demand and supply is projected to widen in the future (World Bank, 2017). It also leads to low-income levels for households engaged in livestock production, perpetuating a vicious poverty cycle.

Agricultural education is the process of imparting knowledge, skills, and attitudes in agriculture to learners at any level. It is a form of vocational training that entails exposing learners to the desired knowledge, skills, attitudes, and aptitudes in all processes of agricultural production, as well as the techniques for effective teaching agriculture at any given level (Osinem, 2018). According to Akpomedaye (2017), agricultural education is an occupational education designed to develop specific knowledge and skills related to various farming techniques. In this study, agricultural education is a programme in colleges of education and other tertiary institutions designed with a series of activities for equipping students with the knowledge, skills, and attitude in pedagogy in agriculture required for effective teaching of content areas in agriculture to students in tertiary institutions. According to Tewarie (2016), tertiary institutions are those that are involved in teaching and learning processes that occur following secondary school education and provide academic credits and competencies that lead to certificates, diplomas, and degrees from universities, polytechnics, colleges of education, and similar institutions after graduation.

A graduate is a person who has successfully completed a course of study or training, especially one for which they have been awarded an academic degree. Graduates in this study are individuals who have completed or received agricultural training from a specialized institution (KADP, 2016). For agricultural education graduates in south-western Nigeria to be functional, saleable, and self-employed in society after

graduation, they need skills in poultry farming (Eje, *et al*., 2021).

One major challenge prevalent among agricultural education graduates in Nigeria is incompetence to sustain agricultural productivity, which leads to food scarcity and unemployment. Entrepreneurship skills training is yet to be felt among the majority of agricultural graduates in south-west Nigeria. This has led to poverty, unemployment, and general underemployment in the study area. The country's lack of jobs necessitates that graduates in vocational training put their skills into practice to create employment for themselves and even others. However, in south-western Nigeria, this is still the case, as graduates still move around in different states of the region looking for jobs. This may be due to a lack of required skills among agricultural education graduates or their inability to identify employment opportunities in their locality. This might have made vocational agricultural education training ineffective.

Similarly, graduate unemployment in Nigeria gives rise to several societal ills, among which are hooliganism, thuggery, rape, ritual, armed robbery, prostitution, kidnapping, cultism, and serial killing. The Federal Government of Nigeria, in an attempt to stimulate and create jobs for the youths as well as ensure their sustainable development, had previously set up numerous developmental projects in the rural areas for the youths to enable them to acquire relevant entrepreneurial and vocational skills for sustainable development (Nwaobiala, *et al.*, 2018). In the same vein, the National Directorate of Employment (NDE) (2016) reports that one of its major goals is to encourage youths to explore numerous agricultural opportunities, such as poultry production, for wealth creation and employment generation.

Graduates need adequate mobilization through skill training to successfully start and manage their own businesses in order to achieve sustainable development. Graduates of agricultural education are fully empowered through the acquisition of entrepreneurial skills, which they may use to create wealth through self-employment. Empowering youth to start their own businesses necessitates the proper acquisition of skills through education and training. The deficiencies of poor skills acquisition by prospective entrepreneurs in vocational agriculture, particularly poultry production, informed the researcher's quest to conduct this study titled management skills required by graduates of agriculture for sustainable poultry production in South-Western Nigeria.

Purpose of the Study

The overall objective of the study is to find out the management skills required for sustainable poultry production by graduates of agriculture in south-west zone Nigeria. Specifically, the study sought to:

i. describe the socio-economic characteristics of poultry farmers among graduates in south-west zone, Nigeria; and
ii. find out the management skills (house planning, rearing, brooding, medications and vaccination, grading and sorting, litter management and farm record) required for sustainable poultry production by graduates of agriculture.

Research Questions

The following research questions were used to guide the study:

1. What are the socio-economic characteristics of poultry farmers among young graduates in south-western Nigeria?
2. What are the management skills required for sustainable poultry production by young graduates of agriculture?

Hypotheses

$H0_1$: There is no significant difference in the mean ratings of opinions of farm managers in Oyo, Ogun and Osun State, South-West, Nigeria on management skills (house planning, rearing, brooding, medications and vaccination, grading and sorting, and farm record) in sustainable poultry production by young graduates of

agriculture based on their area of specialization.

Methodology

This study employed a descriptive research design using survey method. The study's population consists of 345 subjects from the selected university, including graduates in agriculture and agricultural education, lecturers offering Agricultural Science as a course, and poultry farmers in the southwest zone. In Nigeria, the randomly selected states are: Ogun, Oyo, and Osun. A multistage sampling technique was used to select the southwest state. Out of the nine (9) universities of education that offer Agricultural Science as a course in south-west Nigeria, which encompasses federal, state, and private universities in each state, they were purposesively selected based on the graduate population. A purposive sampling technique was employed to select five (5) lecturers from each of the selected universities, giving a total of 45 (forty-five) respondents. The procedures were in three stages: the pre-test stage (four weeks), which has already been done; the test stage (four weeks); and the post-test stage (four weeks). Twelve weeks were used for the study.

Results and Discussion

Research Question 1

What are the socio-economic characteristics of poultry farmers among young graduates in south-western Nigeria?

Poultry producers' socioeconomic characteristics include their production technique, occupation, years of experience, flock size, labour source, capital source, management style, and more. 35.29 percent of respondents were in the 30-39 age group, 33.33 percent were in the 40-49 age range, 27.45 percent were in the 50-59 age range, and 3.93 percent were in the 60+ age range. The bulk of the poultry producers in the study area are young adults (20-39) with the education and experience to handle the demanding schedule and physical demands of poultry farming. The findings show that among the respondents (poultry producers), 68.63% are male and 31.37% are female in the area under study. According to the report, most of the poultry producers in the area are males. Since males traditionally take on the role of breadwinner in their families, this may explain why more men than women launch their own companies.

It turns out that 47.05 percent of respondents are in a committed relationship, whereas only 37.25% are married, 5.90% are divorced, and 9.80% are widowed. The results show that 47.05 percent of respondents are in a committed relationship. One possibility might be that people in the area being studied are trying to fulfil financial responsibilities by joining the poultry production sector.

The findings showed that the majority of respondents (80.39%) were from families with 1–5 people, while the remaining 19.61% came from households with 6–10 people. Most poultry producers have a household size of one to five, according to the statistics (80.39 percent). Many of the farmers and responders in this study only had one or two partners, which may explain why their families were often modest (numbering between one and five people).

3.99% of respondents did not finish elementary school; one-point ninety-six percent finished middle school; 27.5% finished high school; and 66.6% finished college. Since 94% of poultry farmers have a post-secondary education or above, this statistic shows that the vast majority of those in the poultry farming industry are educated. This equips them with the knowledge and skills to practice sustainable agriculture, which in turn improves resource management and yields healthier chickens.

Research Question 2

What are the management skills (house planning, rearing, medications and vaccination) required for sustainable poultry production by young graduates of agriculture?

Table 1
Summary of Multiple Regression Analysis on Composite Contributions of Management Skills (House Planning, Rearing, Medications and Vaccination) on Sustainable Poultry Production

Sources of Variance	Sum of Squares	Df	Mean Square	F	Significant
Regression	33.380	2	16.690	3.034	0.038*
Residual	1067.170	338	5.500		
Total	130.550	345			

R = 0.697, R Square = 0.485, Adjusted R Square = 0.348, Std. Error of the Estimate = 2.11613

Table 1 shows the composite contribution of management skills (house planning, rearing, medications and vaccination) on sustainable poultry production. Table 1 reveals that the composite contribution of management skills (house planning, rearing, medications and vaccination) on sustainable poultry production by young graduates of agriculture was significant ($F_{(4,194)} = 3.034$; $p<0.05$). The table further revealed a multiple regression coffiencient (R = 0.697) and multiple regression adjusted ($R^2 = 0.348$), This implies that 34.8% of the variation in young graduates of agriculture' sustainable poultry production.

Hypothesis 1
There is no significant difference in the mean ratings of opinions of farm managers in Oyo, Ogun and Osun State, South-West, Nigeria on management skills (house planning, rearing, brooding, medications and vaccination, grading and sorting, and farm record) in sustainable poultry production by young graduates of agriculture based on their area of specialization

Table 2
One-way Analysis of Variance (ANOVA) Test

		N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Management Skill	Ogun	232	129.8750	47.19983	3.09882	40.00	232.00
	Osun	214	151.2617	54.65390	3.73606	57.00	232.00
	Oyo	242	140.0165	44.54696	2.86359	28.00	232.00
	Total	688	140.0945	49.45165	1.88533	28.00	232.00

Table 2 shows that Osun has the highest mean management skill score, followed by Oyo and then Ogun. However, Ogun has the lowest standard deviation and standard error, indicating less variability in management skill scores compared to Osun and Oyo. This suggests that while Osun may have higher average management skill scores, there is more consistency in performance among individuals in Ogun. Empirical evidence supporting this result could be found in a study analyzing the distribution of management skill scores within each state, highlighting the variance in performance levels among individuals (Hoffman & Shipper, 2012). On the other hand, Pedraza-Rodríguez, *et al.* (2023) reveal that factors such as access to resources or training opportunities play a larger role in determining management skill scores than regional differences alone.

Conclusion

The findings showed that raising poultry is financially viable and might help people become more self-sufficient and less reliant on government handouts. Poultry producers are often small-holder farmers with a low rate of resource utilization due to the enterprise's financial restrictions. This study demonstrates how economically productive even small-scale poultry farmers can be. By

reducing the mortality rate, the feed conversion rate, and the production duration, they may raise their technical and financial efficiency and therefore achieve economic sustainability. With less money spent on feed and day-old chicks in particular, poultry manufacturing will become much more profitable. Increases in capacity utilization, literacy, and poultry production would also boost the farms' productivity. Small-scale poultry producers who are not working near the profit frontier need to minimize technical and allocation inefficiencies if they want to maximize practical profit.

Recommendations

Based on the findings of study, the following recommendations are deemed necessary in order to improve the resource use efficiency of the enterprise.

1. Farmers must follow bird vaccination schedules and practice good cleanliness to prevent illness.
2. Farmers are advised to stock pen at the appropriate season, when the occurrence of diseases is at its lowest.
3. Inadequate vaccinations administered by institutions should be made readily available to farmers at a price they can pay.
4. Due to little government support, farmers are often left unaware of more up-to-date methods of production.
5. Farmers should organize into cooperatives so that they may buy feed in bulk at a discount and share production strategies to raise yields.
6. Due to a lack of funds, the government, via institutions like the Bank of Agriculture, might help local farmers increase their poultry chicken output.
7. Increases in flock size, medication usage, water, and litter material are all advised for producers because of their impact on poultry chicken weight growth.

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IMPROVEMENT TRAINING NEEDS OF AGRICULTURAL EDUCATION LECTURERS IN THE USE OF COMPUTER RESOURCES FOR EFFECTIVE TEACHING IN UNIVERSITIES IN SOUTH EAST, NIGERIA

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Abstract
*This study examined improvement training needs of Agricultural Education lecturers in the use of computer resources for effective teaching in Universities in South East, Nigeria. Three research questions and one null hypothesis guided the study using a descriptive survey. The population of the study was 159 Agricultural Education lecturers drafted from selected Public Universities offering Agricultural education programme in South East, while 87 Agricultural Education lecturers drafted from selected Public Universities in South East, Nigeria were purposively used as the sample size (Abia, Ebonyi and Imo State). The instrument for data collection was a self-structured questionnaire, titled: Agricultural Education Computer Resources Improvement Needs Questionnaire (AECRINQ), duly validated was used for the study and the reliability of the instrument was established using Cronbach alpha, which yielded a co-efficient index of 0.81. The researcher and 15 trained research assistants administered and retrieved the questionnaire, with a 99.3% return rate. Mean and standard deviations were used to answer the research questions and t-test statistic was used to test the null hypotheses at.05 level of significance. The analyzed data revealed that agricultural education lecturers need improvement training in the following computer resources areas: window environment and Microsoft word competencies, Microsoft Excel and power point competencies and the internet and networking competencies required by Agricultural education lecturers in the use of computer resources for effective teaching. The study recommended among others that **i**n-service training programme should be organized for the lecturers of agricultural education on different computer resources usage competencies for effective delivery of the agricultural education programme in universities.*

Keywords: Agricultural Education Lecturers, Computer resources, Improvement needs, Effective Teaching

Introduction

Tertiary institutions offering undergraduate agricultural programs must undergo major change and must be on the cutting edge and provide students with the chance to learn about the complexities of agriculture, address its new challenges, and discover their opportunity to participate as leaders. Thus, curriculum development and teaching techniques need to be considerably more dynamic than they have traditionally been (Njura, *et al*., 2020). The use of computer resources in the teaching and learning process is one of the strategies used to enhance agricultural education globally and promote sustainable agriculture (Ra, *et*

al., 2019). Computer resources have inevitably become the most powerful tool in almost every aspect of human's daily life as is regarded as the precursor of major revolutions in various aspects of human endeavors, including education. The use of computer resources is the new paradigm of learning in the 21st century that allows people to easily access, gather data, analyze and transfer of knowledge (Madumere-Obike, *et al.*, 2015). This makes it possible to function as teachers, study mates and more importantly, as tools to improve the entire teaching and learning process. This current development which relates to the role of computer resources and the Internet shows that the phase of the whole educational system has changed. Computer resources hold immense capability to gradually transform and remould education (Assar, 2015). The ultimate impact of computer resources may be seen on the structure, content and outcomes of learning, both inside and outside of school.

The past two decades have witnessed a dynamic shift in the way the computers have been used as a tool in the teaching-learning process. Today, the trend appears to be towards the creation of courses specifically aimed at computer literacy, as well as towards integrating computer technology in other content areas across the curriculum. Furthermore, computer technology has increasingly been applied towards non-instructional (record keeping, grade averaging, communication, etc.) and pre-instructional (developing materials, researching instructional content, etc.) uses. This great change has brought forth a fresh perspective in the use of computers in the teaching-learning process. The recent advancement in information technology innovations and computer usage is rapidly transforming work culture and teachers cannot escape the fact that today's teaching must provide technology-supported learning. Moreover, links have been made between computer use and constructivist, collaborative, and inquiry-based learning and also pedagogical change (Scrimshaw, 2004). Some researchers suggest that computer technology can overhaul education, serving as a panacea, or as an agent of change. Generally, it is accepted that computers have the potential to enhance teaching and learning (Roblyer, 2003) and provide students with a learning experience that other strategies cannot provide (Wellington, 2005). Therefore, being prepared to adopt and use technology and knowing how that can support student learning must become integral skills in every teacher's professional repertoire.

Recognizing the challenge of the "information age", the National Curriculum Framework for School Education and the National Council of Educational Research and Training (NCERT) in the Curriculum Guide Syllabus for Information Technology in Schools, 2001 addresses at length the question of integration of ICT into schooling, acknowledges the pedagogical rationale behind this integration and brings to the fore its manifold implications. NCERT not only undertakes the development of training materials for teachers and syllabus or instructional materials for students but also holds training/orientation programmes for teachers towards basic ICT skills relevant to school education and developing ability to use ICT-based learning materials for the classroom. It is now possible to give education to a large number of people without having to pay for expensive physical infrastructure. Mohammed (2003) claims that several nations, particularly those in the industrialized world and some in the developing world, are implementing policies and programmes intended to change their economies into ones based on information and technology. Teachers and students no longer have to rely solely on printed books and other materials in physical media housed in libraries, making ICT a potentially powerful tool for extending educational opportunities, both formal and non-formal (Ssekakubo, *et al*., 2011). ICT is utilized in the classroom to prepare today's students for a job where ICTs, notably computers, the internet, and related technologies, are

becoming more and more commonplace. Teachers can use ICT in a variety of ways to save material, such as lesson plans, diagrams, and images of things pertinent to their courses, for later retrieval. The internet can be utilized as a teaching tool to explore, study, solve problems, and interact, according to Olugbeko and Izu (2013). This enables students to exchange ideas with peers from outside the classroom and even from other countries. As a result of ICT facilities, learners can no longer be viewed as empty vessels waiting to be filled but rather as active organisms seeking meaning, the teacher is that of a guide. In developed countries like Europe and American, ICT has almost replaced conventional way of teaching and learning.

Currently in Nigeria, there is a great demand for ICT driven education. The Federal Ministry of Education in conjunction with supervisory bodies like National Universities Commission (NUC) and National Commission for College of Education (NCCE) has taken a positive step towards meeting the computer demand in education. For example, computer education courses are now made compulsory for students in tertiary institution throughout the country. Consequently, ICT is assuming a very important position in the development of the Nigeria's educational system. Transferring relevant information, values, skills, attitudes, beliefs, and moral for the collective wellbeing of the individual and his society requires proper and effective communication. Nigeria, in a quest to join ICT world, further set up an ICT policy. The federal executive council approved this policy and established the National Information Technology Development Policy as the implementing body. This policy was lunched for implementation in April 2001. According to Iloanusi and Osuagwu (2010), it may be in keeping with the government policy as demonstrated above that a number of governmental and non-governmental organizations, banks, and private citizens have funded the adoption of ICT in Nigerian educational institutions at all levels, and that strategic plans and projects are constantly being carried out to review targets in the area of ICT. Due to the fact that teachers are the ones who actually carry out any curriculum, this commitment from governmental and non-governmental organizations also means that the importance of the teacher's role in the proper and effective use of ICT in the teaching and learning process cannot be overstated. Thus, the teacher's aptitude, skill, knowledge, creativity, and competency are crucial.

In spite of the enviable importance of computer resources, it was discovered by the researchers in the area of the study through focus discussion with some of the teachers of agricultural education that the teachers were having problems and serious difficulties in use of computer for effective teaching of their students. The difficulty of the teachers in use of computer might be responsible for the failure of school graduates to adequately use the computer resources and the inability of most of these school graduates to demonstrate any production skill in agriculture which defeat the objective of teaching agricultural education for self-reliance. To put an end to the inability of the agricultural education teachers in the use of computer and to achieve the objective of teaching agricultural education in tertiary levels for self-reliance, these teachers need training on the use of computer for effective teaching of their subject, hence this study.

Theoretical Framework

Human Capital Theory was propounded by Schultz in 1967 which states that the stock of competences, knowledge and personality attributes embodied in the ability to perform labour so as to produce economic value (Oluwuo & Nwabueze, 2016). It is the attributes gained by a worker through education and experience. The work of human capital theory rests on the assumption that capacity building is highly instrumental and even necessary to improve the production capacity of the school. Human capital theory emphasizes how education increases the productivity and efficiency of workers by

increasing the level of cognitive stock of economically productive human capability, which is a product of innate abilities and investment in human beings (Oluwuo & Nwabueze, 2016). The provision of formal education is seen as a productive investment in human capital, which the proponents of the theory have considered as equally or even more equally worthwhile than that of physical capital. According to Fagerlind and Saha (1997), human capital theory provides a basic justification for large public expenditure on education both in developing and developed nations. The theory was consistent with the ideologies of democracy and liberal progression found in most Western societies. Its appeal was based upon the presumed economic return of investment in education both at the macro and micro levels. Efforts to promote investment in human capital were seen to result in rapid economic growth for society.

For individuals, such investment was seen to provide returns in the form of individual economic success and achievement. Most educationists agree that it is human resources of nation, not its capital nor its material resources that ultimately determine the character and pace of its economic and social development. It increases their chances of employment in the labour market and allows them to reap pecuniary and non-pecuniary returns and gives them opportunities for job mobility. Education however, is a source of economic growth and development only if it is anti-traditional to the extent that it liberates, stimulates and informs the individual and teaches him how and why to make demands upon himself. Accordingly, a human capacity building would manifest itself in staff performance and the quality of graduates produced. This theory is not only imperative but also indispensable to the achievement of educational and organizational goals. Hence, when lecturers are properly equipped with their capacity building needs through ICT, it boosts up their morale to perform their duties effectively. This enhances the quality service delivery.

Purpose of the Study

The purpose of this study was to examine the improvement training needs of agricultural education lecturers in the use of computer resources for effective teaching in Universities in South East, Nigeria. Specifically, the study sought to:

i. determine improvement training needs of teachers of Agricultural Education in introduction to computer and computer system for effective teaching in Universities in South East, Nigeria;
ii. examine improvement training needs of teachers of Agricultural Education in Microsoft Excel and Power point for effective teaching in Universities in South East, Nigeria; and
iii. Ascertain improvement training needs of teachers of Agricultural Education in internet usage and Networking for effective teaching in Universities in South East, Nigeria.

Research Questions

The following research questions were put forward to guide the study:

1. What are the improvement training needs of teachers of Agricultural Education in introduction to computer and computer system for effective teaching in Universities in South East, Nigeria?
2. What are the improvement training needs of teachers of Agricultural Education in Microsoft Excel and Power point for effective teaching in Universities in South East, Nigeria?
3. What are the improvement training needs of teachers of Agricultural Education in internet usage and Networking for effective teaching in Universities in South East, Nigeria?

Hypothesis

HO_1: There is no significant difference between the mean responses of male and female Agricultural education lecturers on the introduction to computer and computer system for effective teaching in Universities in South East, Nigeria.

Methodology

The study adopted descriptive survey research design and it was considered suitable because the opinion of a representative sample of respondents was sought using questionnaire and the finding was generalized on the entire population. Three research questions and one null hypothesis guided the study. The population of the study was 159 agricultural education lecturers from selected Public Universities offering agricultural education programme in South, while 87 agricultural education lecturers from selected Public Universities in South East, Nigeria was purposively used as the sample size (Abia, Ebonyi and Imo state). Instrument for data collection was a self-structured questionnaire, titled: Agricultural Education Computer Resources Improvement Needs Questionnaire (AECRINQ), duly validated and used for the study. The instrument was face – validated by three experts: Two from Vocational and Technical Education Department and one from Measurement and Evaluation Department- all in University of Nigeria, Nsukka and Michael Okpara University of Agriculture, Umudike respectively.

Cronbach Alpha reliability method was adopted to determine the internal consistency of the questionnaire items. A Cronbach Alpha coefficient of 0.81 was obtained. The researcher and 15 trained research assistants administered and retrieved the questionnaire, with a 99.3% return rate and the collected data was analyzed using mean for research questions and t-test was used for the test of hypothesis. Any mean response of 2.50 and above was considered agreed while any mean response below 2.50 was considered disagreed, more so the hypothesis was tested at 0.05 level of significance.

Results

Research Question 1

What are the improvement training needs of teachers of Agricultural Education in introduction to computer and computer system for effective teaching in Universities in South East, Nigeria?

Table 1

Mean and Standard Deviation on Improvement Training Needs of Teachers of Agricultural Education in Introduction to Computer and Computer System for Effective Teaching in Universities in South East (N=87)

S/N	Introduction to Computer and Computer System Improvement Training Needs	$\bar{x}$	SD	Remark
1	I need improvement training in identification of computer	3.20	.82	Agreed
2	I need improvement training in description of how computer Process data and information	3.23	.85	Agreed
3	I need improvement training in personal computer (pc) Components	3.30	.83	Agreed
4	I need improvement training in classification of computer based on memory size & processing abilities.	3.10	.80	Agreed
5	I need improvement training in uses of information Technology.	3.07	.82	Agreed
6	I need improvement training in functions of various computer Hardware	3.03	.82	Agreed
7	I need improvement training in identification of input devices	2.93	.80	Agreed
8	I need improvement training in understanding types of computer storage	3.30	.83	Agreed
9	I need improvement training in basic features and terminology of operating system	3.10	.80	Agreed
	Grand Mean	**3.14**		

SD = Standard Deviation of the respondents and $\bar{X}$ = Mean of the respondents

Table 1 revealed that all the 9 items had mean rating between 2.93 to 3.30 and were above the cut-off point of 2.50. This indicates that the respondents agreed that they need improvement training in introduction to computer and computer system for effective teaching in universities. The standard deviation of all the items ranged from .80 to .85, which showed that the respondents were not too far from the mean and opinion of one another in their responses on the improvement training needs of teachers of agricultural education in introduction to computer and computer system for effective teaching in Universities in South East, Nigeria.

Research Question 2

What are the improvement training needs of teachers of agricultural education in Microsoft Excel and Power point for effective teaching in Universities in South East, Nigeria?

Table 2

Mean and Standard Deviation on the Improvement Training Needs of Teachers of Agricultural Education in Microsoft Excel and Power Point for Effective Teaching in Universities in South East, Nigeria (N=87)

S/N	Microsoft Excel and Power Point Improvement Training Needs	$\bar{x}$	SD	Remark
1	Terminologies in Ms Excel is an area I need improvement training	2.65	.48	Agreed
2	I need improvement training in creating and working with Excel Worksheet	2.72	.50	Agreed
3	I need improvement training in working with Excel tools	2.95	.85	Agreed
4	I need improvement training in designing and creating graphics	2.60	.49	Agreed
5	I need improvement training in working with cells and cell formatting	2.63	.58	Agreed
6	I need improvement training in designing new presentation from a Customized design template	3.18	.83	Agreed
7	I need improvement training in designing organizational chart and Diagrams	3.17	.76	Agreed
8	I need improvement training in creating, Opening and Formatting files	2.65	.48	Agreed
9	I need improvement training in working with cells and cell formatting	2.72	.50	Agreed
	Grand Mean	**2.81**		

SD = Standard Deviation of the respondents and $\bar{X}$ = Mean of the respondents

Data in Table 2 revealed that all the 9 items had mean rating scores ranging 2.63 to 3.18 and were above the cut-off point of 2.50. This indicates that the respondents agreed that they need improvement training in Microsoft Excel and Power point for effective teaching in universities. The standard deviation of all the items ranged from .48 to .85, which showed that the respondents were not too far from the mean and opinion of one another in their responses on the improvement training needs of teachers of agricultural education in Microsoft Excel and Power point for effective teaching in Universities in South East, Nigeria.

Research Question 3

What are the improvement training needs of teachers of agricultural education in internet usage and Networking for effective teaching in Universities in South East, Nigeria?

Table 3

Mean and Standard Deviation on the Improvement Training Needs of Teachers of Agricultural Education in Internet Usage and Networking for Effective Teaching in Universities in South East, Nigeria (N=87)

S/N	Approaches in Managing Adverse Impact of Climate	$\bar{x}$	SD	Remark
1.	I need improvement training in description of internet	3.31	.73	Agreed
2.	I need improvement training in describing website	3.40	.64	Agreed
3.	I need improvement training in using internet address such as URL and other site address	3.40	.64	Agreed
4.	I need improvement training in browsing on the Internet with browsers	3.31	.73	Agreed
5.	I need improvement training in using search engine and Network communication equipment for research findings	3.28	.70	Agreed
6.	I need improvement training in step-by-step approaches to printing web Pages	3.26	.68	Agreed
7.	I need improvement training in downloading and opening downloaded Files from websites	3.24	.76	Agreed
8.	I need improvement training in using Network communication equipment	3.22	.75	Agreed
9	I need improvement training in usage of services on the internet (worldwide web, protocols, Emails)	3.31	.73	Agreed
	Grand Mean	**3.30**		

SD = Standard Deviation of the respondents and $\bar{X}$ = Mean of the respondents

Data in Table 3 revealed that all the 9 items had their mean ratings ranging from 3.22 to 3.40 and were above the cut-off point of 2.50. This indicates that the respondents agreed that they need improvement training in internet usage and Networking for effective teaching in universities. The standard deviation of all the 9 items ranged from .64 to .76, which showed that the respondents were not too far from the mean and opinion of one another in their responses on the improvement training needs of teachers of agricultural education in internet usage and Networking for effective teaching in Universities in South East, Nigeria.

Hypothesis 1

There is no significant difference between the mean responses of male and female Agricultural education lecturers on the introduction to computer and computer system for effective teaching in Universities in South East, Nigeria.

Table 4

t-test Analysis of Mean Difference Between Male and Female VTE Lecturers on the Male and Female Agricultural Education Lecturers on the Introduction to Computer and Computer System for Effective Teaching in Universities

Gender	N	X	SD	Df	t-cal	t-crit	Sig.	Decision
Male	55	2.70	.52					
				50	1.22	1.67	.063	Accepted $H0_1$
Female	32	2.89	.61					

Source: paired Samples t-test Result from SPSS

Data on Table 4 shows that t-cal of 1.22 is less than the t-crit of 1.67 at 0.05 level of significance, which indicates that the hypothesis stated is accepted. With the foregoing, we therefore accept the null hypothesis for the items and reject the alternate hypothesis. Which means there is no significant difference between the mean

responses of male and female Agricultural education lecturers on the introduction to computer and computer system for effective teaching in Universities in South East, Nigeria.

Discussion of Findings

Findings on Research Question 1 revealed that identification, definition & Characteristics of computer, description of how computer Process data and information, personal computer (pc) Components, classification of computer based on memory size & processing abilities, terminology and uses of information Technology, functions of various computer Hardware and peripheral, identification of input devices and their uses, types of storage, their capacities and specific uses and basic features and terminology of operating system among others were the improvement training needs of teachers of agricultural education in introduction to computer and computer system for effective teaching in Universities in South East, Nigeria. The standard deviation of all the items ranged from .80 to .85, which showed that the respondents were not too far from the mean and opinion of one another in their responses on the improvement training needs of teachers of agricultural education in introduction to computer and computer system for effective teaching in universities. However, the findings of the above study were in agreement with the view of Ibezim (2011), where it was found out that technicians of hardware repair needed 11 basic online skills for effective entrepreneurship. Additionally, the skills are ability to: Operate computer, create website, Access websites, produce tent documents, retrieve save documents, upload and download Information and create e-mail address. More so, the result is in line with the report of Odeyemi and Longe (2019) in a study carried out on the perception of commercial subject teachers on availability and use of information communication and technology in teaching in secondary schools where it was concluded that commercial subject's teachers needed in service training description of how computer Process data and information works and in the general use of ICT for effective teaching of their students.

Findings on Research Question 2 revealed that terminologies in Ms Excel, creating and working with Excel Worksheet, training in working with Excel tools, training in designing and creating graphics, training in working with cells and cell formatting, training in designing new presentation from a Customized design template, training in designing organizational chart and diagrams, training in creating, Opening and Formatting and Slides and training in working with cells and cell formatting among others were the improvement training needs of teachers of agricultural education in internet usage and Networking for effective teaching in Universities in South East, Nigeria. The standard deviation of all the items ranged from .48 to .85, which showed that the respondents were not too far from the mean and opinion of one another in their responses on the improvement training needs of teachers of agricultural education in Microsoft Excel and Power point for effective teaching in Universities in South East, Nigeria. However, the findings are in agreement with Odeyemi and Longe (2019), where it was concluded that commercial subject teachers needed in-service training description of how computer Process data and information works and in the general use of ICT for effective teaching of their students. Also, this finding was in conformity with the findings of Ezenwafor and Nwankwo (2017) in a study carried out on supervisors rating of computer competencies possessed by secretaries for effective performance in the public service of Anambra State where it was found out that teachers of agricultural science in senior secondary schools in Ekiti State needed competency training in the following competencies in Microsoft Excel and Power point: Creating and working with Excel worksheet, working with Excel tools, working with cells and cell formatting, applying calculation logic in Excel, printing of worksheet, designing new presentation, creating opening and formatting slides,

running of presentations and printing of slides.

Findings on Research Question 3 showed that description of internet, describing website and Email, using internet address such as URL and other site address, training in browsing on the Internet with browsers, using search engine and Network communication equipment for research findings, step by step approaches to printing web Pages, downloading and opening downloaded Files from websites, using Network communication equipment and using different services on the internet (worldwide web, protocols, Emails) were the improvement training needs of teachers of agricultural education in internet usage and Networking for effective teaching in Universities. The standard deviation of all the 9 items ranged from .64 to .76, which showed that the respondents were not too far from the mean and opinion of one another in their responses on the improvement training needs of teachers of agricultural education in internet usage and Networking for effective teaching in Universities in South East, Nigeria. This finding is in consonance with the findings of Ibezim (2011), who found out that technicians needed 16 social Networking skills for effective entrepreneurship. Additionally, this finding was in conformity with the findings of Akuegwu, *et al.* (2011) who suggested that vocational teachers needs training in internet-connected laptops, CD-ROM database, institutional virtual library (digital library), institutional website, institutional functional e-mail address, departmental computer laboratory, departmental functional e-mail address, computer networking (wide area network and local area network), examination scoring machine (OMR), electronics class roll (ECR), multimedia classrooms (audio visual centre), computer screen reading software, institutionally-produced educational software and departmental website is very low for quality instructional service delivery in the classrooms. More so, there was no significant difference between the mean responses of male and female Agricultural education lecturers on the introduction to computer and computer system for effective teaching in Universities in South East, Nigeria.

Conclusion

This study concluded that agricultural education lecturers in the universities need capacity building in identified area of computer resources use to be more efficient in their duties. Based on that and due to the enviable importance of the use of computer, teachers of agricultural science having difficulties in the use of computer should strive to keep up with the phase of technological advancement, particularly in the usage of window operating system Microsoft word and internet to enhance effective teaching of their students.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Management of schools should also help to improve the training of teachers in the use of computer technology resources in teaching and learning through seminar, workshop and in-service training.
2. Efforts should be made by teachers themselves to upgrade their knowledge of computer technology utilization for effective teaching and learning
3. Government should provide adequate computer resources for effective teaching in the Universities.

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FARMERS PERSONAL STATUS IN CIVIC AGRICULTURE PRACTICES AS TOOL TO PROMOTE SUSTAINABLE FOOD SECURITY AMONG RURAL FARMING FAMILIES IN ODOGBOLU, OGUN STATE

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Abstract
This study investigated farmers personal status in civic agriculture practices as tool to promote sustainable food security among rural farming families. This is predicated on the fact that Nigeria as a country has majority of the households being food insecure, especially the rural farming households. The study was guided by three null hypotheses at p > 0.05 level of significance. The descriptive research design was adopted to conduct the study. In all, twenty-five farming families were sampled using purposive sampling technique. The instrument used was researchers-designed structured questionnaire titled "Farmers status in civic agriculture practice for food security" (FSCAP4FS). Cronbach-alpha reliability method was used to establish the internal consistency of the instrument which gave a coefficient value of 0.82. The data collected were analysed using mean and standard deviation for descriptive data and analysis of covariance was used for the hypotheses testing. The findings showed that family economic status and education of family head contributed significantly to civic agricultural practices in promoting food security among farming families unlike the family size that did not. It concluded that there is no consistency in the outcomes with past studies in the area of food security. Based on the findings, it recommended amidst others that the government should make concerted efforts to ensure easy access to credit facilities to farmers. The education of the farming families should be strengthened in all ways either formally or informally.

Keywords: Civic agriculture, farming families, sustainable, food security, personal status

Introduction

The primary basic need of man and animal is food without which the existence, physiological and anatomical functions of man is ultimately jeopardized. It won't be out of order to argue that hunger has been reasoned as the leading cause of death in the world, more importantly in the developing countries. Naturally, the planet has provided humanity with tremendous resources, but with unequal access and inefficient handling which had compelled several numbers of people to become malnourished. Perhaps this manifested as a resultant effect in the rise of food insecurity in Nigeria which necessarily demands prompt action. To buttress this position of food insecurity, Osabohien (2020), affirmed that 21.4% of Nigeria families were experiencing acute food insecurity. In their own view, Erokhin and Gao (2020) posited that 50% of Nigerian population is living below poverty line of 1.9USD. The global food security index (GSFI) rating reveals that Nigeria ranked 94th out of 113 nations which puts the country below Ethiopia, Niger, and Cameroon (Ayinde, *et al*., 2020). In a study carried out by Amzat and Aminu (2020), it reported that food insecurity in Nigeria is aggravated by rapid population growth based on the

prediction that Nigeria's population would grow to 400 million people by 2050. It suggested that the country must strategize to check her population growth if food security is to be improved to achieving the desired results. It therefore behooves on researchers to interrogate this area of scholarship in order to stem the tide of continuous rising food insecurity in the country.

Generally speaking, food security and insecurity are two opposing terms used to describe how much access or lack of access to sufficient and nutritious food are available to a population. According to Food and Agriculture Organisation (FAO, 2017), food security involves food access, availability, use and sustainability; hence, a people can be said to be food secured when they are able to get adequate, safe and nutritious diets all year round. Though, a greater proportion of the food in-secured are residing in developing countries of the world, yet food security has become a top priority concern for both developing and developed countries (Mohammed et al., 2021). The reason being that household food insecurity is responsible for a huge proportion of malnutrition and deaths in developing countries (Drammeh *et al*., 2019). This has brought the attention and emphasis on food security as a target in the sustainable development goals (SDGs).

Going by the aforementioned, it is then commendable that the United Nations had come up with the sustainable development goals which has as its goal number two, zero hunger. The goal two states thus: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture". It calls for: zero stunted children under the age of two, 100% access to adequate food all year round, all food systems are sustainable, 100% increase in small holder productivity and income, zero loss or waste of food. In his explanation, Ritchie (2021) asserted that smallholder farmers produce 29% of the world's crops, measured in kilocalories and they do so using around one-quarter (24%) of the world's agricultural land. These farms account for an even greater share of the world's food supply, one-third (32%) of it. This is because smaller farms tend to allocate a larger share of their crops towards food, rather than animal feed or biofuels.

The SDG2 recognizes the inter linkages among supporting sustainable agriculture, empowering small farmers, promoting gender equality, ending rural poverty, ensuring healthy lifestyles, tackling climate change, and other issues addressed within the set of 17 sustainable development goals agenda. The United Nations came up with eight targets to eradicate world hunger, that is 2.1 to 2.8 however, this study is interested in targets 3 and 4 (2.3 & 2.4). This is predicated on the fact that the target is on small scale farmers welfare and well-being as such a shift in increasing the productivity of smallholder farming is a crucial step in countries transitioning from poverty to middle-incomes. Raising the output and incomes of smallholder farmers should be an important focus, even if they produced very little of the world's food. This is because most of the world's farms are smallholders, and they are some of the poorest people in the world.

The 2.3 is captioned "Double the productivity and income of small-scale food producers". Its objective is that by 2030, double the productivity and incomes of small-scale food producers, in particular women, indigenous peoples, farming farmers, pastoralists and fishers. This is including, through secure and equal access to farmland, other productive resources and input, knowledge financial services, markets and opportunities for value addition and non-farm employment. Research efforts must have a way to connect with the intentions of the SGD agenda. While the 2.4 is captioned "sustainable food production and resilient agricultural practices". Its own objective is that by 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters

and that progressively improve land and soil quality. In the spirit of this laudable mandate of the SDGs, researchers can only leverage to make great impact on the society to making the 2030 target a reality of sustainable agenda. This research focused on the civic agriculture practices as tool toward sustainable food security among small holding farmers.

It is then imperative that all hands must be on-deck to improve food security for the ever-growing human population of the world and more particularly our country, Nigeria. On sustainable food security, it is seen as a way people have physical, social and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preference for an active and healthy life through the four pillars of food availability, access utilization and stability and the dimensions of sustainability. In other words, efforts geared deliberately to meet this condition will go a long way to give the citizenry lease of life towards well-being and healthy life that can sustain productivity in contribution to per capital growth and gross domestic product of the country.

Meanwhile, evidences have shown that food insecurity is closely related to socio-economic characteristics such as: poverty, low income, employment status, age, household size, level of education, among others (Otunaiya & Ibidunni, 2014; Yusuf, *et al.*, 2015; Drammeh, *et al.*, 2019; Haddabi, e*t al.*, 2019; Yahaya & Danmaigoro, 2020; Mohammed, *et al*., 2021; Fikire and Zegeye, 2022). Additionally, it has been reported that an increased level of education can translate into higher level of food security (Haddabi, et al., 2019; Yahaya & Danmaigoro, 2020; Mohammed *et al*., 2021). On adoption of agricultural practices, Oyetunde-Usman, *et al.* (2021) found that gender, female household heads were less likely to adopt improved seeds and mixed cropping practices. In a way, this is suggestive of female farmers lagging roles in the adoption of modern innovative sustainable agricultural practices (SAPs). The study also gave consideration of family size in the adoption of such practice. It further revealed that households consider sustainable land practices to protect against common production shocks such as flooding, pest and disease attack.

In ensuring food security, there are challenges posed as 9.3 billion people worldwide is needed to be fed by 2050. To achieve food security, there are several methods that can be employed which will ultimately improve food security in itself; ranging from reducing food waste, to enhancing infrastructure and promoting more efficient production techniques. From the foregoing, the rural farmers and farming families can be situated to relate to the category of having personal status characteristics of poverty, low income and employment status, and a host of others that can promote food insecurity or security; hence, the rationale of this study to focus on them. The study of Fikire and Zegeye (2022) explained that determinants of food insecurity can be broadly categorized into social, economic, environmental, political and physical factors. Whereas, many countries have become more food insecure as a result of factors such as: land degradation, population explosion, lack of productive resources, drought, insufficient assets, poverty and deprivation.

At any rate, food insecurity has been and remained a public health threat that needs attention by all concerned and particularly in the scholarship regime; especially to check problems of malnutrition, dietary diversity needs and psychological dysfunction, as advocated by (Drammeh, *et al.*, 2019; Haddabi, *et al*., 2019; Yahaya & Danmaigoro, 2020). Studies on determinants of food security have been conducted across the world and they range from environmental, institutional, socio-personal status and safety-related perspectives. In a bid to focusing on a more pragmatically and sustainable approach, this study concentrates more on the intervention through the concept of civic agriculture practices. The study of Herrera, *et al.* (2021) showed that food insecurity increased with increasing household size

(model averaged coefficient = 0.74, p = 0.002), and decreased with larger harvests of vanilla and rice. Furthermore, respondents that had small land size and large household size had a significantly higher probability of food insecurity than respondents with small land and small household size. The effect of household size on food insecurity decreased as land size increased such that when land size was large, there was no difference in food insecurity in relation to household size. Food insecurity did not differ significantly between single female headed households and households with male heads or female heads with a partner (coefficient = 0.02, p = 0.95). Furthermore, on education of household members, there was no effect.

Suggesting for ways to ensuring and promoting sustainable agenda, Guiné, (2021) opined that agricultural practices, alternative sources of food supply, and public policies are determinants for more sustainable food security. As a guide to this study, civic agriculture practices were conceptualised to address this concern of Guiné, and other scholars in the same school of thought. Civic agriculture is a locally organised system of agricultural and food production characterized by networks of producers who are bound together by place. Civic agriculture embodies a commitment to development and strengthening of environmentally, economically and socially sustainable system of agricultural and food production that relies on local resources and serves the local market and consumers. Civic agriculture is fundamentally about problem-solving. This study attempts to show that a turn toward civic agriculture throughout Nigeria rural communities should begin to "relocalize" their food and agricultural systems so that we can promote sustainable food security.

Small scale family farms are the drivers of the expansion of agriculture both in developed and developing countries, and they display particular socioeconomic, environmental and technological dynamics (Bonfiglio *et al.*, 2017). They have developed life strategies to face various ways of applying a set of practices and functions that contribute to the improvement of agricultural systems, not only at the local level but in urban environments (Santacoloma-Varón, 2015, Quimbayo Ruiz, *et al*., 2020). Farmers, including small scale farming have experienced continuous transition processes that in many cases have favoured the development of agriculture, strengthening productive agricultural employment and increasing the total income of the sector, globally, regionally and nationally (van der Ploeg *et al.*, 2019, Laurett *et al*., 2021), civic agriculture can best suit this position. Peasants, who obviously are small scale farmers are clear example of applying agricultural management practices to improve crop productivity and subsequently implement various ways to alleviate poverty, especially among small holding farmers (Teklewold, *et al*., 2013, Abera, *et al*., 2020), in this case, small scale rural farming families are good exemplars. Some of these practices include mixed cropping techniques, crop rotation, integrated pest and disease management, application of animal manure, planting of cover crops, and no-tillage (Nkomoki *et al*., 2018, Darkwah *et al*., 2019, Abera *et al*., 2020, Oyetunde-Usman *et al*., 2021). It is noteworthy to state that these practices (mixed cropping techniques, crop rotation, integrated pest and disease management, etc.) will qualify as civic agriculture practices.

Family farms at all scales are seen as critical actors in achieving the Sustainable Development Goals (SDGs). In both low and middle-income countries, poverty among small farmers, in particular, is widespread and in many countries. Apparently, getting small-family farms out of poverty and ensuring their access to basic services, ownership and control over land and other forms of property, can be germane to achieving the goals of ending poverty (SDG 1) and hunger (SDG 2). In ensuring enabling conditions for family farms more generally, so they can achieve higher levels of economic productivity through diversification, sustainable agricultural practices and innovation, including through a focus on

high-value added and labour-intensive sectors, will also be critical not only for the aforementioned SDGs but also, in part, to achieve economic growth (SDG 8) and more sustainable production patterns (SDG 12).

Family farmers are pivotal in rendering agri-food systems more inclusive, sustainable, resilient and efficient, not only due to family farming employing 30 percent of the world's population and producing over 80 percent of the world's food in value terms (FAO, 2014), but also given their role as custodians of biodiversity, landscapes and cultural heritage. There are currently more than 600 million family farms around the world (Lowder, *et al.*, 2019), with more than 98 percent of farms being less than 20 hectares (HLPE, 2013), while 90percent of people employed in fisheries and half of the global fish catches come from small-scale fisheries (FAO, 2020a). In other words, farming families are veritable avenues to prompt and promote the use of sustainable practices in food production process like the concept of civic agriculture. Despite family farmers being key in sustainably transforming agri-food systems to nutritiously feed the world, it remains that they are among the most affected by poverty and vulnerability (FAO, 2020b). More than 75 percent of the world's poorest live in rural areas and depend on agriculture for their livelihood, with family farmers in particular small-scale food producers, women, youth, indigenous peoples and ethnic minorities, among those facing the highest levels of economic, financial, social and environmental risks (FAO & IFAD, 2019). It has become imperative to look at the farmers personal status in attaining sustainable food security for the society at large and the world in the whole. Farmers personal status under consideration here include, family status, family size and education of family head in relation to civic agriculture practices on their farm holdings. The livelihoods of the small farm families consist primarily of diversified agricultural systems. They tend to be more at the subsistence than the commercial farming level (Abera, *et al.*, 2020, Phondani, *et al*., 2020).

In the study of Yahaya and Danmaigoro (2020), it found out that the food security incidence for the insecure household is 0.59 while that of the food secure household is 0.41. This shows that 40.8% of the farming households in the study area were food secure while 59.2% were food insecure. They remarked that household with highly educated head are more likely to be food secure than those with low level of education. They posited that food security is assured with increase in household size and income. Similarly, the study further showed that large household sizes were also found to be significant on food security status of in the study area. On their own part, Otunaiya and Ibidunni (2014) confirmed that household size (-0.449) also having a negative coefficient and significant at 1% level. Farm size coefficient (0.192) is significant at 5% and is positive, indicating that as farm size increases, more food is produced both for consumption and sale to earn more money, resulting in increased food security. Knowing that farm size is the total area of land cultivated to food and cash crop by households, measured in hectares. The findings of Kwornu, *et al*., (2013) revealed positive relationship between farm size and improvement in households' income and food security. The larger the farm size of the household, the higher the expected level of food production. It is, therefore, expected of a household with a larger farm size to be more food secure than a household with a smaller farm size, all things being equal. Hence the expected effect on food security becomes positive.

Whereas, Otunaiya and Ibidunni (2014) found that the coefficient of educational status of household head (1.386) was positive and significant at 1% implying increased education would result in increase in food security status. The study also interrogated the positions of earlier studies carried out in other areas of the country. The diverse findings are not the same, hence we could conclude that they are inconclusive.

The negative coefficient (0.000035) of total monthly household income of the farmers is not significant at 5% thereby indicating low economic status will lead to food insecurity in the study area. In the study of Samim, *et al.* (2021), education level was found to have a statistically significant association with food insecurity in farming households. This result revealed that with an increase in the level of education, there was a 12.4% and 3.7%, respectively, more likelihood of farm households being in the food secure and mild food insecure groups. In contrast, it was approximately 6.4% and 9.6% less likely that these respondents were from farmers' households characterized by moderate and severe food insecurity, respectively. In addition, this result indicated that a farm household head with a low education level was more likely to be food insecure. The findings indicated that farming households with a high degree of household head education and a high farm income, were less likely to be food insecure.

Still on the status of education of the farmers, the study of Haddabi, *et al*. (2019) established that majority of the respondents were literate and this can enhance their food security status. More particularly, the level of education of household head is an important factor to improved farm production and management techniques. It also determines income earning capacity and food expenditure. It concluded that literate status can improve food security status and also the adoption of improved farm practices simply because educated farmers adopt agricultural innovations easier, and this could improve their agricultural productivity and at the end ensure food security. The level of education of household head is an important factor to improved farm production and management techniques as much as scholars have adduced to the fact that literate status can improve food security status and also the adoption of improved farm practices. Educated farmers adopt agricultural innovations easier, and this could improve their agricultural productivity and ensure food security. In another dimension, Yusuf, *et al.* (2015) claimed that at the active working age, household heads adopt innovation that positively affect their productivity and income.

The distribution of the respondents by household size shows that most (87.49%) of the respondents have household sizes of 1 - 9 persons, while about 12.40% have household size of 10 persons and above. They explained that larger household size tends to reduce per capita food expenditure of the household, thus increasing their likelihood of being food insecured as espoused in another study that the larger the family size the lesser the food availability to each person within the household and also nutritional status may be affected.

Considering the economic status of the farmers, the results of Ibrahim, *et al.* (2019) revealed N32,238 as the average annual income which implies that majority of the respondents (76.6%) were low-income earners considering the magnitude of their total monthly income from farming which was their major occupation and that might have affected their food security status. On household income, Kuwornu, *et al.* (2013) showed that this variable has positive influence on food security status of farming households. The variable has the expected sign and is significant. This indicated the higher the income of households, the greater the probability of being food secure. While Samim, *et al*. (2021) established in their findings, yearly farm income represents a significant factor linked with food insecurity status in farmers' families. The results indicated that one additional unit increase in farm income (yearly) raises the likelihood of experiencing food security and mild food insecurity (marginally food secure) and reduces the susceptibility of farm households to moderate and severe food insecurity. This may be because when farms' marginal productivity and contribution to the family income increases, the farm household food security is expected to increase. It is against the background of the foregoing that this study was fashioned out to investigate the farmers personal status in civic agriculture practices as tool to promote sustainable food

security among rural farming families in Odogbolu, Ogun State.

Hypotheses

The following null hypotheses were formulated and tested at $p > 0.05$ level to guide the study:

$H_0$1: There is no significant contribution of family economic status in civic agriculture practices as tool to promote sustainable food security.

$H_0$2: There is no significant contribution of family size in civic agriculture practices as tool to promote sustainable food security.

$H_0$3: There is no significant contribution of education level of family head in civic agriculture practices as tool to promote sustainable food security.

Methodology

The study adopted descriptive survey research design which was considered appropriate because the opinions of a representative sample of respondents was sought using questionnaire and the findings were generalised on the entire population. The population of study area was small scale farming families in the existing fifteen wards in Odogbolu Local Government Area. The sample covered five wards with five farming families each, making a total of twenty-five. The sampling technique was purposive and sampled farmers comprised those who cultivated not more than two hectares (2ha) but showed willingness to participate and volunteered themselves for the study. The instrument used for data collection was a researcher-designed structured questionnaire code-named "Farmers status in civic agriculture practice for food security" (FSCAP4FS). It consisted of two sections A and B, the section A has seven items namely: ward of respondent, native origin, civic agriculture practices, farming land size, family monthly income, family size and education of family head. The section B consisted of fourteen items in statements that revolved around innovative ways to produce, process and market/distribute food items. Only six statements were negatively worded and eight were positively worded with four responses options of strongly agreed (SA), Agreed (A), disagreed (D) and strongly disagreed (SD) with corresponding values of 4, 3, 2, 1 for positive and 1, 2, 3, 4 for negative statements. The instrument was face validated by three extension agents working with local farmers in the Ijebu agricultural zone. To determine its reliability, it was trial tested on five farmers in Ijebu-North local government area, the result was analyzed using Cronbach-alpha method which yielded a coefficient value of 0.82 for the items. The data collection was done in sixteen (16) days by visiting the farmers in their villages through the assistance of the Extension agent attached to the study area. Though the instrument was prepared in English language the researcher needed to translate the statements to Yoruba language for proper understanding of the respondents. The data collected were analyzed using both descriptive (mean and standard deviation) and inferential (analysis of covariance) statistical tools. The ANCOVA was used to test the null hypotheses at $p > 0.05$ level of significance.

Results

Hypothesis 1

There is no significant contribution of family economic status in civic agriculture practice as tool to promote sustainable food security.

Table 1 (a)

Descriptive Statistics for Mean Differences in the Contribution of Family Economic Status in Civic Agriculture Practices as Tool to Promote Sustainable Food Security

Family Economic Status	Mean	Std. Deviation	N
Low	18.2222	1.92209	9
Medium	22.6667	1.21106	6
High	27.6000	1.89737	10
Total	23.0400	4.50444	25

Table 1(a) presents the descriptive statistics showing mean differences in the contribution of family status in civic agriculture practices as tool to promote sustainable food security. The mean score for the contribution of family economic status in civic agriculture towards promoting sustainable food security recorded for farmers with low family status was 18.22 and that of medium family status was 22.67 while that of high family status was 27.60 with standard deviation of 1.92, 1.21 and 1.89 respectively. However, Table 1(b) further revealed the significant difference.

Table 1 (b)

Analysis of Covariance for Difference in the Contribution of Family Economic Status in Civic Agriculture Practices as Tool to Promote Sustainable Food Security

Tests of Between-Subjects Effects

Dependent Variable: Civic agriculture practices as tool to promote sustainable food security

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	417.671a	2	208.836	66.308	.000
Intercept	12416.633	1	12416.633	3942.420	.000
Family Economic Status	417.671	2	208.836	66.308	.000
Error	69.289	22	3.149		
Total	13758.000	25			
Corrected Total	486.960	24			

a. R Squared = .858 (Adjusted R Squared = .845)

The results in Table 1(b) presents the analysis of covariance showing significant difference in the contribution of family economic status in civic agriculture practice as tool to promote sustainable food security. The results indicate significant outcome (i. e $F = 66.308$; $p < 0.05$). This outcome implies that there is significant difference in the reported means as presented in Table 1(a). Hence, the hypothesis of no difference is hereby rejected. Therefore, there is significant contribution of family economic status in civic agriculture practices as tool to promote sustainable food security. The farmers are low-income earners though, the result showed a significant outcome of family economic status. In other words, the value of the marginal effect implies that if households' income increases by maybe say one Naira (N1.00), the probability of the household being food secure will be increased by 0.0001, provided that all other things remain constant.

Hypothesis 2

There is no significant contribution of family size in civic agriculture practices as tool to promote sustainable food security.

Table 2 (a)

Descriptive Statistics for Mean Differences in the Contribution of Family Size in Civic Agriculture Practices as Tool to Promote Sustainable Food Security

Family Size	Mean	Std. Deviation	N
Small	22.7273	4.24478	11
Large	23.2857	4.84258	14
Total	23.0400	4.50444	25

Table 2(a) presents the descriptive statistics showing mean differences in the contribution of family size in civic agriculture practices as tools for promoting sustainable food security. The mean scores for the contribution of family size in civic agriculture towards promoting sustainable food security recorded for farmers with small family size was 22.73 while that of large family size was 23.29 with standard deviation of 4.24 and 4.84 respectively. However, table 2(b) further reveals the significant difference.

Table 2 (b)

Analysis of Covariance for Difference in the Contribution of Family Size in Civic Agriculture Practice as Tool to Promote Sustainable Food Security

Tests of Between-Subjects Effects

Dependent Variable: Civic agriculture practice as tools to promote sustainable food security

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.921a	1	1.921	.091	.766
Intercept	13041.921	1	13041.921	618.433	.000
Household Size	1.921	1	1.921	.091	.766
Error	485.039	23	21.089		
Total	13758.000	25			
Corrected Total	486.960	24			

a. R Squared = .004 (Adjusted R Squared = -.039)

The results in Table 2(b) present the analysis of covariance showing significant difference in the contribution of family size (household size) in civic agriculture practices as tool for promoting sustainable food security. The results indicate a non-significant outcome (i. e $F = 0.091$; $p > 0.05$). This outcome implies that there is no significant difference in the reported means as presented in Table 2(a). Hence, the hypothesis of no significant difference is hereby retained. Therefore, it is concluded statistically that there is no significant contribution of family size in civic agriculture practices as tool to promote sustainable food security. If we are tempted to rationalize that the larger the farm size of the household, the higher the expected level of food production. It is, therefore, expected of a household with a larger farm size to be more food secure than a household with a smaller farm size, all things being equal. Hence, the expected effect on food security should be positive. The implication of the current finding to food security is that food production will remain at a subsistence level and this can lead the respondents to diversification into non-farm activities in other to be food secure.

Hypothesis 3

There is no significant contribution of education level of family head in civic agriculture practices as tool to promote sustainable food security.

Table 3 (a)

Descriptive Statistics for Mean Differences in the Contribution of Education Level of Family Head in Civic Agriculture Practices as Tool to Promote Sustainable Food Security.

Educational level of Family Head	Mean	Std. Deviation	N
Low	16.8000	1.30384	5
Medium	21.1250	1.45774	8
High	26.9167	2.35327	12
Total	23.0400	4.50444	25

Table 3(a) present the descriptive statistics showing mean differences in the contribution of educational level of family head in civic agriculture practices as tool to promote sustainable food security. The mean score for the contribution of educational level of family head in civic agriculture practices towards promoting sustainable food security recorded for farmers with low education is 16.80 and that of medium level was 21.13 while that of high educational level was 26.92 with standard deviation of 1.30, 1.46 and 2.35 respectively. However, table 3(b) further revealed the significant differences.

Table 3 (b)

Analysis of Covariance for Difference in the Contribution of Education Level of Family Head in Civic Agriculture Practices as Tool to Promote Sustainable Food Security

Tests of Between-Subjects Effects

Dependent Variable: Civic agriculture practices as tools to promote sustainable food security

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	404.368[a]	2	202.184	53.856	.000
Intercept	10296.592	1	10296.592	2742.710	.000
Education Level	404.368	2	202.184	53.856	.000
Error	82.592	22	3.754		
Total	13758.000	25			
Corrected Total	486.960	24			

a. R Squared = .830 (Adjusted R Squared = .815)

The result in Table 3(b) presents the analysis of covariance showing significant difference in the contribution of education level of family head in civic agriculture practices as tool to promote sustainable food security. The results above indicate a significant outcome (i.e. $F = 53.856$; $p < 0.05$). This outcome implies that there is significant difference in the reported means as presented in Table 3(a). Hence, the hypothesis of no difference is hereby rejected. Therefore, there is significant contribution of education level of family head in civic agriculture practices as tool to promote sustainable food security. The result may not be unconnected with the constant extension agent contact with the farmers which opened them to constant education and information dissemination. This finding may be explained by the notion that education is the key to obtaining information on better agriculture production, increased household income, better adoption of agricultural practices and better decision making especially towards sustainable food security.

Discussion of Findings

The findings in the family economic status showed differences in the low, medium and high levels through descriptive analysis. When further subjected to analysis of covariance it showed a significant contribution of family economic status in civic agriculture practices as tool to promote sustainable food security. This result is similar to the finding of Ibrahim, *et al.* (2019) where the respondents are low-income earners. The finding is in line with Kuwornu,

et al. (2013) claiming that family income has significant influence on food security status of farming families. Buttressing this position in the same manner, Samim, *et al.* (2021) posited that yearly farm income represents a significant factor that is linked with food insecurity status in farmers' families. If the family economic status (household income) has been identified to have significant effect on food security status of households in the study area. The import of this outcome is that farmers must always have sufficient income to purchase the food they are unable to grow. It will then be important to encourage farming families to intensify on combination of their farm enterprises with off-farm activities that could generate more income for the households and also help to improve their asset base.

Another finding showed that the descriptive statistics indicate mean differences in the contribution of family size in civic agriculture practices as tool for promoting sustainable food security between the small and large sizes. On further scrutiny with analysis of covariance, it was concluded statistically that there is no significant contribution of family size in civic agriculture practices as tool to promote sustainable food security.

This finding negates that of Yahaya and Danmaigoro (2020) and Otunaiya and Ibidunni (2014) that significantly food security is assured with increase in household size. Meanwhile, this result may partially relate to the findings of Yusuf et. al., (2015) which showed that the larger the farming household size the more prone to food insecurity. Going by the assertion that the larger the family size the lesser food availability to each person within the household and also nutritional status is likely to be affected. It is advisable to initiate a programme or policy that will reduce tension on the per capita food expenditure of the individuals in the farming family setting which could have been induced by increase in family numbers.

The finding based on the descriptive statistics showed mean differences in the contribution of educational level of family head in civic agriculture practices as tool to promote sustainable food security among the low, medium and high levels. On further analysis of covariance, it was established that there is significant difference in the reported means. In other words, there is significant contribution of education level of family head in civic agriculture practices as tool to promote sustainable food security in the study area. This result aligns with a study conducted in Nigeria by Haddabi, *et al.* (2019) and Otunaiya and Ibidunni (2014), but in contrast in Afghanistan by the study of Samim, *et al.* (2021). Also, in Nigeria through the findings of Yahaya and Danmaigoro (2020). This finding has shown that majority of respondents are educated through one form or the other with significant contribution which might enhance the food security status. There is also the likelihood of easy and desirable adoption of improved farm practices like the civic agriculture practices. This will ultimately impact on their farming family production in the end.

Conclusion

The study investigated the farmers personal status as tool to promote civic agriculture practices among farming families in the study area. Findings showed that the status of the farmers in terms of family economic, family size and education of family head supported some earlier studies carried out by various scholars and researchers and also diverged from some others. It then means that there is no consistency in the outcomes with past studies in the area of food security. Essentially, this particular study concentrated on the sustainable agenda.

Recommendations

In the aftermath of the outcomes of the study, the government should make concerted efforts to ensure easy access to credit facilities and provide a sound machinery towards subsidized cost of farm input. This will assist the farming families in facing the business of farming enterprise

without any distraction in looking for other secondary occupation that could complement their family incomes.

In addition, institutionalizing a policy for effective community participation in design of ideas aimed at imparting knowledge about family planning and access to family planning facilities should be given adequate attention and priority by the government. This will greatly assist in adhering to manageable family sizes across the state to support farming families.

Due to the significance of education in improving food security, the progress of community-based education should be systemically approached. It is recommended the education of the farming families should be strengthened in all ways either formally or informally. More especially, the extension agents must keep working closely with these farmers to achieve sustainable food security in the study area in line with the SDG agenda of 2030 set goal.

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PROBLEMS FACING CASSAVA PRODUCTION AND PRESERVATION AND ITS IMPLICATION ON FOOD SECURITY IN OVIA NORTH-EAST LOCAL GOVERNMENT AREA, EDO STATE.

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Abstract
This study determined the problems facing cassava production and preservation, and its implication on food security in Ovia North-East Local Government Area of Edo State. The descriptive survey research design was adopted for the study. The population of the study comprises of 430 farmers in the study area out of which 207 were selected using the simple random sampling technique. Four research questions were raised to guide this study. The instrument for the study was questionnaire, validated by three experts, two from the Department of Vocational and Technical Education, Faculty of Education and the other from the Department of Crop Science, Faculty of Agriculture, University of Benin. The reliability of the instrument was done using Cronbach alpha statistics, which yielded a co-efficient of 0.83. The data was collected by the researchers and analyzed using mean and standard deviation. The findings of the study revealed that some of the problems facing cassava production and preservation are: pests and diseases, unpredictable climatic condition, scarcity of healthy cuttings, poor extension services, scarcity of farm labour, poor storage facilities and infrastructure, laborious and unhygienic processing. The study also revealed that the above problems result to low yields and low profits, food loss and wastage, unemployment and low income, bad economy, chronic health conditions and poverty. Lastly, the study revealed the roles played by the government, which includes; implementing policies that favours cassava farmers and processors, providing social amenities, organizing extension services and providing loan grants to cassava farmers. The study recommended that Agricultural extension agencies should take note of the factors limiting cassava production and endeavor to step up their services in those areas of needs. It was also recommended that farmers should employ more of the productive resources such as improved varieties and also increase farm size and labour to boost their productivity.

Keywords: Cassava Production, Cassava Preservation, Food Security, Shelf Life

Introduction

Cassava holds a prominent position in Nigeria as the primary staple crop, being an integral part of daily meals for Nigerians and its cultivation spans tropical regions worldwide due to its remarkable resilience in challenging growing conditions, making it one of the most drought-tolerant crops.

The root of cassava plant is the most commonly consumed part and offers incredible versatility. It can be eaten whole, grated, or ground into flour, making it suitable for various applications such as bread and crackers. Additionally, cassava root serves as a raw material for tapioca, starch, and garri, a tapioca-like product. According to Ajmera and Elliott (2021), those with food allergies can find cassava root beneficial for cooking and baking due to its gluten-free, grain-free, and nut-free properties. Moreover, cassava root stands out for its high content of vitamin C, an essential antioxidant that supports collagen production and boosts the immune system. It is also rich in copper, a mineral crucial for neuro-transmitter synthesis, energy production, iron metabolism, and other functions. Cassava contains significant amounts of resistant starch, a type of starch that resists digestion and shares characteristics with soluble fiber. Besides its role as a food crop, cassava holds immense importance as a significant source of income for households. Its cultivation as a cash crop contributes substantially to poverty alleviation, generating income for a large

number of households compared to other staple crops.

In the past, crude cassava extract has been utilized to address certain types of cancer (Iyuke, *et al*., 2004). Cassava contains a substance called amygdalin, also known as Vitamin B17, which consists of two glucose molecules, a cyanide radical, and benzaldehyde. Amygdalin is found in certain nuts, plants, and fruit seeds and has been used by some individuals for cancer treatment. However, there is no scientific evidence supporting its effectiveness, and it is associated with potential serious side effects. The Food and Drug Administration (FDA) does not recognize it as safe. The use of vitamin B17 as a cancer treatment is considered controversial, as there is limited scientific evidence supporting its safety and efficacy. Moreover, taking vitamin B17 can lead to the production of cyanide, a toxic and hazardous substance, posing significant risks to health. While there may be some potential health benefits associated with amygdalin, it is crucial to consider the severe risks it presents

Cassava can be divided into two categories: sweet and bitter. Both types, like other root crops, contain antinutritional components and toxins, but the bitter varieties contain higher levels of these substances. It is crucial to prepare cassava properly before consumption, as inadequate preparation can result in the presence of residual cyanide, leading to acute cyanide intoxication, goiters, and even severe outcomes such as ataxia, partial paralysis, or death. In times of food insecurity, the more toxic varieties of cassava have been used as a last resort for sustenance. Interestingly, farmers often choose to cultivate bitter varieties due to their ability to deter pests, animals, and thieves.

Cassava thrives in moist soils, although sandy clay loam with good drainage and a stable water table is considered most suitable. However, it is important to note that cassava is often associated with poverty and has faced criticism for its potential to deplete soil nutrients and contribute to soil erosion (Hershey, *et al*., 2001). Cassava production encounters numerous challenges that encompass various aspects. These include the presence of pests and diseases such as cassava mosaic disease, cassava bacterial blight, cassava anthracnose disease, cassava bud necrosis, root rots, mealybugs, and green mites. Weather-related issues, poor soil quality, land degradation, livestock damage, excessive fertilizer use, scarcity of planting materials, and limited market access are also significant concerns in cassava production.

The harvested roots of cassava have a short shelf life and typically deteriorate within three to four days. As a result, immediate consumption or processing into more storable forms becomes necessary. However, the bulkiness and high perishability of the roots require prompt processing. The available simple processing methods, such as pounding, grating, or chipping, are often time-consuming. The specific processing steps involved in cassava depend on the desired end product. Generally, the stages of cassava processing encompass peeling, washing, grating, chipping, drying, dewatering, fermentation, pulverization, sieving/sifting, and frying.

The existing methods of cassava processing are insufficient, labor-intensive, and costly, despite the fact that processing adds value to cassava and prolongs its shelf life. Access to efficient processing tools and machines is often limited and financially burdensome for farmers, with a lack of engineered solutions available at the farm level. Currently, the available equipment includes graters, dryers, and dewatering machines, with some success observed in the use of graters and certain dewatering tools. However, the dewatering tools operate in batches, whereas continuous machines are required for optimal production in factories. Nevertheless, with proper handling of harvested cassava, effective processing techniques, and appropriate preservation methods, it is possible to contribute to maintaining food security in Nigeria.

Food security is characterized by the availability, access, and utilization of

sufficient, safe, and nutritious food that meets the dietary needs and preferences of individuals for a healthy and active life. It encompasses three key components: the presence of adequate quantities of suitable food (availability), the ability to obtain food through adequate income or resources (access), and the consumption of a well-rounded diet with efficient nutrient absorption (utilization/consumption). Cassava, being a rapidly expanding staple crop in cassava-producing nations, has gained significant importance among farmers and has seen a consistent rise in industrial demand. Food and Agricultural Organization (FAO, 2018). Cassava plays a crucial role in ensuring food security as it can be cultivated in less fertile soils, provides a source of income for farmers, and serves as a staple food for many households.

However, food security in Nigeria has experienced a decline recently, primarily due to various underlying factors that, if not addressed appropriately, can pose serious challenges to the Nigerian economy. The prevalence of food insecurity is on the rise in Nigeria, primarily driven by limited economic access to food, whether directly or indirectly. Factors contributing to food insecurity include poverty, unemployment, low income, lack of affordable housing, and chronic health conditions or limited access to healthcare. Inappropriate agricultural policies and programs implemented by the government in Nigeria have also been identified as significant contributors to the food insecurity rate. To improve food production and subsequently enhance food security, there is a need for consistent enhancements in labor productivity and crop yields. These improvements will have a positive impact on the socioeconomic well-being of smallholder farmers. Therefore, it is crucial to understand the interplay between cassava production, farm income, and food security in order to develop effective intervention strategies

Despite the rapid growth in cassava production, the cassava subsector in Nigeria is still constrained by a number of factors, namely pests and diseases, agronomic problems, shortage of planting materials, inconsistent policy measures, poor market access, limited diversification of processing options, inefficient extension delivery system and inadequate access to improved processing technology. There is the problem of rapid post-harvest deterioration of the tubers following removal from the soil, which limits its marketability. The traditional processing of cassava root is unhygienic. Grated cassava tubers and products such as garri and chips are dried on open surfaces such as flat roof tops, bare grounds. These drying processes may take several days or weeks leaving product exposed to rodents, insects and various environmental hazards such as rain resulting to the growth of moulds on products.

It has become necessary to assess the various problems facing cassava production and preservation in the country. The traditional methods of producing, processing and preservation of cassava and its products has resulted to reduction in yields, quality and various post-harvest losses as crops are attacked by pests and diseases both in field and in storage. Improved production, processing and preservation procedures should therefore be employed to convert fresh cassava tubers into safer and more profitable products.

Purpose of the Study

The aim of this study was to investigate the various problems facing cassava production and preservation in Edo State of Nigeria. The specific objectives of the study are to:

i. ascertain the various factors affecting cassava production in the study area;
ii. identify the various factors affecting cassava processing and preservation in the study area;
iii. examine the implication of the problems facing cassava production and preservation on food security in the study area; and
iv. determine the roles played by government in improving cassava production,

processing and preservation in the study area.

Research Questions

The following research questions guided this study:

i. What are the various factors affecting cassava production in the study area?
ii. What are the various factors affecting cassava processing and preservation in the study area?
iii. What is the implication of the problems facing cassava production and preservation on food security in the study area?
iv. What are the roles played by government in improving cassava production, processing and preservation in the study area?

Methodology

Descriptive survey design was used, while the study population comprise of 430 farmers in Ovia North East Local Government Area, Edo State. The farmers were selected using simple random sampling technique, this was reached using the Yaro Yamani formula as cited by Uzoagulu (2011). This gives a total number of 207 agriculture students.

Questionnaire was used for the study and this was personally distributed to the respondents by the researchers. The instrument was face validated by three lecturers, two from the Department of Vocational and Technical Education, Faculty of Education and other from the Department of Crop Science, Faculty of Agriculture, University of Benin. The reliability of the instrument was done using Cronbach alpha statistics, which yielded a coefficient index of 0.83. Mean and standard deviation were employed to analyze the data collected. The mean rating of 2.50 was used for decision point such that any item less than 2.50 was regarded as 'disagree' while item with mean rating equal or above 2.50 was regarded as 'agree'.

Research Question 1

What are the various factors affecting cassava production in the study area?

Table 1

Mean Response on the Various Factors Affecting Cassava Production in the Study Area (N=207)

S/N	Item Statement	Mean	SD	Remark
1	The use of traditional methods of production	3.32	.451	Agree
2	Problems of pests and diseases	3.30	.465	Agree
3	Unpredictable climatic condition	3.30	.491	Agree
4	Inadequate transport network and services	3.10	.498	Agree
5	Scarcity of healthy cuttings for production and high cost of planting materials	3.15	.426	Agree
6	Poor extension services	3.00	420	Agree
7	Insufficient capital for farmers to start cassava farming	3.23	.424	Agree
8	Scarcity of farm labour	3.31	.458	Agree

The data shown on Table 1 revealed that mean ratings of the respondents ranged from 3.00 to 3.32. The table shows that all the items (1-8) were rated agree. The result shows that all the various factors contained in the items one to eight (1-8) are agreed to as the factors affecting cassava production by the respondents. The standard deviation ranges from 0.420 to 0.498, showing the respondents are not too far from one another in their responses.

Research Question 2

What are the various factors affecting Cassava Processing and Preservation in the study area?

Table 2
Mean Response on the Various Factors Affecting Cassava Processing and Preservation in the Study Area (N=207)

S/N	Item Statement	Mean	SD	Remark
1	Cassava contains a poisonous substance known as cyanide	3.37	.488	Agree
2	Poor storage facilities and infrastructure	3.10	.467	Agree
3	Poor fermentation procedure or fermentation methods	3.36	.402	Agree
4	Inadequate storage techniques for storing cassava tubers and products	3.56	.456	Agree
5	Laborious and unhygienic processing	3.13	.527	Agree
6	Irregular electricity to operate farm machinery used in processing cassava	2.80	.519	Agree
7	Poor pricing of cassava products after processing	3.22	.466	Agree

The data shown on Table 2 revealed that mean ratings of the respondents ranged from 2.80 to 3.56. The table shows that all the items (1-7) were rated agree. The result shows that all the various factors contained in items 1 to 7 are agreed to as the factors affecting cassava processing and preservation by the respondents. The standard deviation range between 0.402 to 0.519, showing the respondents are not too far from one another in their responses.

Research Question 3
What is the implication of the problems facing cassava production and Preservation on food security in the study area?

Table 3
Mean Response on the Implications of the Problems Facing Cassava Production and Preservation on Food Security in the Study Area (N=207)

S/N	Item Statement	Mean	SD	Remark
1	Low yields and low profits	3.11	.487	Agree
2	Food loss and wastage	3.07	.492	Agree
3	Unemployment and low income	3.03	.548	Agree
4	Bad economy	3.19	.556	Agree
5	Chronic health conditions	3.26	.536	Agree
6	Poverty	3.33	.589	Agree

The data shown on Table 3 revealed that mean ratings of the respondents ranged from 3.03 to 3.33. The table shows that all the items (1-6) were rated agree. The result shows that all the problems contained in the items one to six (1-6) were agreed to as the problems facing cassava production and preservation on food security by the respondents. The standard deviation range between 0.487 to 0.589, showing the respondents are not too far from one another in their responses.

Research Question 4
What are the roles played by government in improving cassava production, processing and Preservation in the study area?

Table 4

Mean Response on the Roles Played by Government in Improving Cassava Production, Processing and Preservation in the Study Area (N=207)

S/N	Item Statement	Mean	SD	Remark
1	Implementing various policies that favours cassava farmers and processors	3.02	.549	Agree
2	Providing social amenities such as power, water, good road etc.	2.62	.541	Agree
3	Organizing extension services to improve farmers and processors knowledge on cassava production, processing and preservation	3.04	.462	Agree
4	Providing loan grant to cassava farmers and processors	3.25	.541	Agree
5	Providing cassava farmers and processors with improved farming technologies	2.31	.533	Disagree

The data shown on Table 4 revealed that mean ratings of the respondents ranged from 2.31 to 3.25. The table shows that the respondents rated items 1-5 agree, while one item (5) was rated disagree. The results show that four of the items on the roles played by the government in improving cassava production, processing and preservation were agree while item five was disagreed. The standard deviation range between 0.462 to 0.549, showing the respondents are not too far from one another in their responses.

Discussion of Findings

The result of the analysis of research question 1 revealed that the use of traditional methods of production, problems of pests and diseases, unpredictable climatic condition, inadequate transport network and services, scarcity of healthy cuttings for production and high cost of planting materials, poor extension services, insufficient capital for farmers to start cassava farming and scarcity of farm labour are the problems affecting cassava production. These findings corroborate the opinion of Mtunda (2009) who reported the major constraints limiting cassava production and productivity to include pests and diseases, poor crop management practices, declining soil fertility, inadequate inputs, erratic weather conditions, limited access to quality planting material and low adoption of improved technologies.

From research question 2, the results shows that; cassava containing a poisonous substance known as cyanide, poor storage facilities and infrastructure, poor fermentation procedure or fermentation methods , inadequate storage techniques for storing cassava tubers and products, laborious and unhygienic processing, irregular electricity to operate farm machinery used in processing cassava, poor pricing of cassava products after processing are the problems affecting cassava processing and preservation. These findings corroborate the work of Abdul-Rahaman and Abdulai (2018) who stated that in Nigeria, as in many developing countries, smallholder farmers are faced with numerous complex challenges including low crop yields, poor infrastructure, poor access to credit and extension services, inefficient and unorganized marketing systems, and information asymmetries which act to increase transaction costs of accessing the input and output markets.

From research question 3, the results shows that low yields and low profits, food loss and wastage, unemployment and low income, bad economy, chronic health conditions and poverty are the Implications of the problems facing cassava production and preservation on food security. The outcome of this study is in accordance with Perret, *et al.* (2005) who stated that food insecurity has resulted to malnutrition, high illiteracy level, low life expectancy, and high incidence of ill health because of low body immunity, financial insecurity, fragmentation

of the family units, inefficiency, and low self-esteem.

From Research Question 4, the results show that implementing various policies that favour cassava farmers and processors, providing social amenities such as power, water, good road etc., organizing extension services to improve farmers and processors knowledge on cassava production, processing and preservation, providing loan grant to cassava farmers and processors, providing cassava farmers and processors with improved farming technologies are the role of government to improve cassava production. This view was corroborated by Ayotunde (2016), who posits that the high cost of mechanization has adversely affected cassava processing and food production in Nigeria, while Chibueze (2016) stated that inconsistent cassava policies discourage cassava processors and reduce the market viability of cassava investments resulting in low level of cassava processing in Nigeria

Conclusion

It has been noted that cassava production, processing and preservation are important to the development of the economy of the country and its products is a major staple of Nigeria rural and urban dwellers. The study revealed that cassava production, processing and preservation are faced with myriads of problems ranging from pests and diseases, inadequate transport services, scarcity of healthy cuttings, poor extension services, inadequate farming technologies, drudgery in labour that has rendered farmers not being able to cope with the growing demand of the population. This study highlights the various problems facing cassava production, processing and preservation, their implication on food security stating possible strategies that can be employed by the government to help solve these problems so that farmers can meet the growing need for cassava and its products.

Recommendations

Deriving from the findings of this study, the following recommendations were made:

1. Agricultural extension agencies should take note of the factors limiting cassava production in the study area and proffer solution.
2. Farmers in the study area need to employ more of the productive resources such as improved varieties, increase farm size and labour to boost their productivity.
3. Ministry of agriculture through research centers should make more effort to make available to farmers improved technologies, such as use of improved variety, proper weeding and planting methods.
4. Government should formulate policy that would encourage farmers to make use of improved technology (seed, fertilizer and other inputs) by improving access to inputs,
5. Government through agricultural extension officers should organize adequate seminars and workshops for farmers in order to improve production and productivity of cassava as well as adoption of technology.

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EFFECTS OF CLIMATE CHANGE ON NIGERIA'S RICE PRODUCTION (1970 – 2020)

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Abstract
Nigeria is a major rice producer but ironically one of the most rice self-insufficient nations. Rice production is significantly affected by weather vagaries. This study analyses the trend of climatic factors (rainfall, average and maximum temperature and humidity, as well as irrigation utility) in Nigeria. The study made use of secondary data from Food and Agriculture Organization FAOSTAT database and Climate Change Knowledge Portal (CCKP) of World Bank from 1970 to 2020. Trend and regression analyses were used to analyze the data. The study describes the trend in rice production in Nigeria, and also determined the factors that affect the output of rice in the country. The result of the study shows that there were fluctuations in the trend of the climatic factors, and an increasing trend in Nigeria rice production. The study also shows that Nigeria has least level of irrigation utility compared to West African sub-region, African continent, and the world at large. The findings also shows that average and maximum temperature were the climatic factors that influenced rice production in the country. A 1% increase in average temperature caused 1.27% increase in rice production while 1% increase in maximum temperature caused 0.82% decrease in rice production. Therefore, maximum temperature has a negative influence and average temperature has a positive influence on rice production. In addition, 1% increase in rate of irrigation utility caused 0.25% increase in rice production. Conclusively, the study suggests encouragement of research towards discovering the methods of ameliorating effects of climate change, especially the irrigation technology use. This would help in enhancing the development of agricultural sector of the economy, and also cause improvement in the rice subsector. Moreover, plant breeders have a duty to assist in developing rice varieties that could withstand and have better yields in adverse climatic conditions.

Keywords: Climate change; rice production; trend analysis; Nigeria

Introduction

Climate change is a long-term alteration in the average weather patterns which have come to define the local, regional and global climatic condition of the earth. Climate change is a global calamity. The inter-governmental panel on climate change projected an upsurge in mean temperature globally of about 1^{o}C beyond the current value come 2025, and 3^{o}C towards the conclusion of following century (International Panel on Climate Change (IPCC), 2002). Climate change is a most grievous challenge facing man. The Sustainable Development Goal (SDG) 13 is tailored toward addressing the problems of climate change. The unsustainable consumption patterns in high-income countries are chiefly accountable for the worldwide climate catastrophe. Each additional individual on the globe is answerable for superfluities of additional emissions. SDG 13 targets prevention of the nastiest effects of climate change.

Climate change has triggered the poorest forms of economic and security problems for mankind. It defines the situations of the resources upon which depends national economies. This phenomenon is one of the tasks that threaten West African sub-region. However, climate change occurs as a result of the release of

greenhouse gases, carbon dioxide, water vapours and nitrous oxide into the atmosphere arising from activities of mankind. These activities comprise burning of fossil fuel, flaring of gases and deforestation (Wikipedia, 2011). Climate change expectedly has greatest impacts on the developing countries (World Bank, 2010). Effects of climate change include higher temperatures, precipitation pattern alterations, rise in sea levels, and more recurrent disasters that are related to weather. These effects jeopardize agricultural activities, food security, and supply of water for agricultural related systems. IPCC (2002) reveals global inter-relationship between climate change and agriculture. Fraser (2008) states that global warming is estimated to have substantial influences on agriculture-related conditions. These conditions include temperature, carbon dioxide, glacial run-off, precipitation and their interface. These conditions define the carrying capacity of the biosphere to yield enough food for human race and his animals. Generally, the consequence of climate change on agriculture would be contingent upon the sense of balance of these effects. Therefore, evaluation of the effects of global climate change on farming may assist in properly anticipating and adapting agriculture towards maximum agricultural production (Fraser, 2008).

There are obvious precarious challenges that agriculture would encounter under climate changes. Availability of water is the most prominent of the challenges. This would have consequence of rising demand and competition for water as well as fluctuating and less predictable precipitation and river flows (Consultative Group on International Agricultural Research (CGIAR), 2009). In Africa, because many livelihoods depend directly on rain for sustenance, any fluctuation in rainfall would result in major threats. IPCC (2002) reports that there would be about 50% yield reduction by 2020 in some African countries that rely on rain fed agriculture, if their agricultural practices are not changed.

Odjugo (2010) states that weather and climate variation has resulted to series of livelihood distress in many parts of Nigeria. The consequences are floods, deforestation, desertification, erosion, drought, rising of sea level, heat stress, pests and diseases, inconsistent patterns of rainfall, and land degradation. More precisely, the South-South geopolitical zone mainly faces the challenges of rising of sea level and changes caused by deforestation. South-East faces issues of erosion, floods and land degradation. North-Central are faced with climate changes as a result of de-vegetation and over-grazing. North-East and North-West have problems of drought, desertification and heat stress (Ozor, 2009). All these features have debilitating effects directly on crops. When temperature surpasses the ideal level for biological processes, crops normally retort adversely showing abrupt reduction in growth, development and yield. Khanal (2009) identifies heat stress to negatively affect the entire physiological development, maturation and yield of farm crops. This harmful consequence on farm yields would be aggravated when there is more recurrent weather vagaries (Futakuchi, 2005). As a result, higher temperatures brought about by climate change would cause significant hazardous effects on rice production. In a distinct study carried out by Matthews, Kropff, Horie and Bachelet (1997), they discovered that there is 5-7% yield decline in major crops including rice, from a $1^{o}C$ increase in average daily temperature. Wassmann, *et al.* (2007) state that climate change is one of the most severe long-term challenges that face the achievement of sustainable growth in rice production. The biotic and abiotic stresses usually predominantly threaten with rice productivity and sustainability. These are further aggravated by intense fluctuations in global climate. Drought and floods have been observed to result in prevalent global rice yield losses. Rice cultivation is vastly reliant on environmental factors. These factors are most essential among numerous production

factors that determine agricultural output levels (Onyegbula, 2017). Edeh, *et al.* (2011) affirm that rice production hinge on optimal combination of production resources if significant yield would be achieved. They assert that these resources include both conventional farm inputs and numerous environmental determinants occasioned by nature. These environmental determinants include intensity and duration of rainfall, relative humidity and temperature. All these have effects in rice yield and productivity. The probable upsurge in incidence of drought and flood as a result of climate change would advance future losses in rice production. Hence, the main problem is the prospective adverse effect of climate change on production and yield of rice (Africa Rice Center, 2004).

In Nigeria, agriculture is the major source of food and employer of labour. Nigeria agricultural sector employs about 60-70% of its population. Agriculture is an important sector of Nigerian economy; it is the source of raw materials used in the industrial sector. Agricultural sector also serves as source of foreign exchange earnings for the country (Mohammed-Lawal and Atte, 2006). Due to the nature of rain-dependent agricultural practices in Nigeria, any climatic alteration would certainly influence its agricultural productivity with consequent effects on other socio-economic activities.

The subject of climate change has turned out to be more frightening both to the socioeconomic sustainable development and agricultural activities of nations, as well as the entirety of human life (Adejuwon, 2004). Kuta (2011) observes that indigenous farmers were earnestly anxious about weather variations due to the effects on food security, availability, stability, accessibility and utilization. Weather alterations also affect livestock, forestry, fisheries and aquatic plant species comprising rice.

Rice is one of the world's most important crops. Its production ensures food security and poverty alleviation. However, this would be disenchanted when there is temperature upsurge and continuous climate alteration in rice-producing regions (Gumm, 2010). Ramirez (2010) records that unanticipated changes accompanying global warming such as temperature, carbon dioxide and precipitation would normally affect rice production. He reveals that temperature rise as a result of climate change undesirably affects the physiology of rice. In the long run, this reduces the yield and grain quality. Gumm (2010) reasserts that increase temperature within preceding 25 years had expurgated the growth rate of rice yield by 10-20%. He further states that this trend could be reversed through improvement in rice production methods, and development of new rice varieties that can tolerate higher temperatures. Else, there might be significant loss in rice production in the coming decades.

The issue of climate change vividly contributed to the deficits in the national rice economy. Though there is evidence of increase in rice production in Nigeria, the nation is not self-sufficient in production of any food crop except cassava. This is due to astronomical increase in rate of population growth. Therefore, the question remains as to whether the production level will ever meet the demand level given the rate of population growth in the country. Also, the proportion of change in production due to impact of climate change will remain an important research focus as well as measures needed to improve the resilience of the farmers to enable them adapt to climate change.

According to Manneh, *et al.* (2007), rice is a foremost grain in Nigeria with respect to output, land area and consumption. It is grown in all the regions of the country. Regardless of availability of cultivable land area, the current Nigeria's rice demand level usually surpasses production level. According to Dataphyte (2022) and Diagi, *et al.* (2021) as shown in Figure 1, Nigeria's rice production increased to 5.63 million metric tonnes in 2019 but the country consumes almost 7 million tonnes of rice in same year. In 2020, rice production plunged to 5.45 million tonnes. With consideration of increase in population rate, it suggests that almost 3 million metric tonnes deficit existed

in the year. As a result of these adverse effects, it is crucial to carry out a study to investigate the effect of climate change on rice production in Nigeria. An understanding of the influence of climate change on rice output in Nigeria forms a key subject that could serve as guide for policy makers. Appropriately, such understanding is required in order that the efforts of the government toward attaining rice self-sufficiency would be actualized.

There are numerous abiotic factors that limit rice production in Nigeria. These include drought, submergence, extreme temperatures, salinity and low soil fertility. In addition, the biotic constraints that affect rice production include weeds and diseases, especially blast. Climate change due to inducing variations in climatic patterns such as rising incidence of drought, extreme temperatures and flooding, and increasing levels of salt stress. All these are expected to worsen these constraints, thus reducing rice yields. Furthermore, the magnitude of production loss as a result of climate change varies depending upon the production systems (rainfed upland, rainfed lowland, irrigated lowland, mangrove swamp and deep water). Manneh, Kiepe. Sié and Traoré (2007) reveal the climate change problems of rice production in Nigeria. According to them, the utmost threats to rice production due to climate change occur in the rainfed rice production systems as a result of their total dependence on rainfall as water source. Also, mangrove rice production systems face greater risks of flooding, coastal erosion, saline intrusion, and storm surges. There is also increase of salinity in irrigated rice production systems. All these are consequences of climate change.

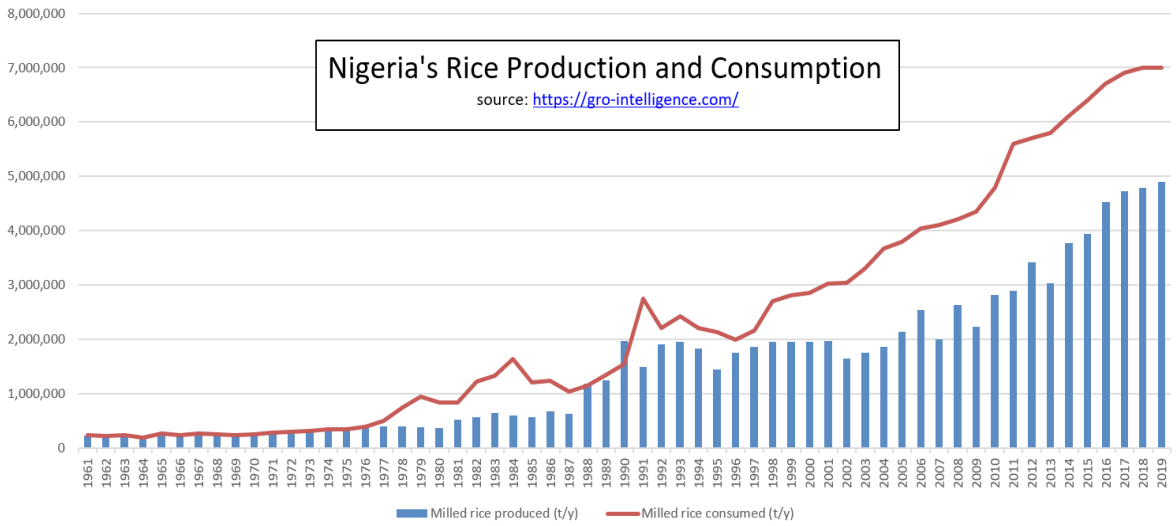


Figure 1: *Nigeria's rice production and consumption 1961 – 2019*
Source: Diagi, *et al.* (2021)

Purpose of the Study

The overall objective of this study was to examine the effects of climate change on rice production in Nigeria. The specific objectives of the study are to:

i. examine the trend of climate change in the study area from 1970-2020;
ii. describe rice production trend in Nigeria in the same period;
iii. examine if there exist long-run relationships among the variables in the study area; and
iv. analyze the effect of climate change on rice production in Nigeria.

Methodology

Area of Study: Nigeria has a population of about 228,181,000 and an area of 923,000 square kilometers (Britannica 2024). The

effects of climate change have directly or indirectly bred the farmers-herders clashes, hence creating internally displaced refugees in the country.

Data Collection and Analysis: The set of data for this study were time series data from secondary sources. Weather and climate data of from 1970-2020 were used. The data on climate was collected from Food and Agriculture Organization FAOSTAT database and Climate Change Knowledge Portal (CCKP) of World Bank. Descriptive graph is used to show the trend of climatic factors which are rainfall, minimum and maximum temperature and humidity and irrigation utility. Also, the yield and production trend (output) of rice in Nigeria was also described through the graph.

Model Specification: The regression model in implicit form is:

$Y_t = a_1X_{1t} + a_2X_{2t} + a_3X_{3t} + a_4X_{4t} + a_5X_{5t} + U_t$

Where Y_t = annual rice output (tonnes)

X_1 = annual average rainfall (mm)

X_2 = annual average maximum temperature (^{0}C)

X_3 = annual average humidity (cmHg)

X_4 = annual precipitation (cm)

X_5 = rate of irrigation utility (%)

t = years

U_t = error term; a = coefficients of estimation

This study introduced irrigation effect by following Cline (1996) and Darwin et al. (2005) who argue in approval of the inclusion of irrigation in their analysis. The reason being that irrigation would always cause amelioration of adverse climatic conditions and influence the crop environment. Some studies (Mendelsohn et al., 1994; Mendelsohn and Dinar, 2003) also endeavor to address climate change problem by modeling irrigation into their studies.

Results and Discussion

Precipitation Trend

The trend analysis was used to determine the trend in average annual rainfall over the period of study in Nigeria. From figure 2, the statistical information of rainfall in Nigeria (1970-2020), shows an erratic trend within the period. The rainfall peaks are noticed in 1976, 1982, 1985, 1992 and 2019 with precipitation values of 658, 613, 738, 652 and 537cm respectively. The lowest precipitation was recorded in 1973, 1996, 1998, 2000-01, 2007, 2009, and 2012 with values of 84, 83, 61, 68, 75, and 90cm respectively. The mean and standard deviation of rainfall in the country over the period of study (1970-2020) are 196.22cm and 165.82cm respectively. The standard deviation shows that there is a large variability in rainfall within the period. There was a sharp increase in 1976, 1982, 1985, 1992 and 2019 in the study area. The rise in rainfall peaked in 1985 and 1992, which were followed by decline in 1993 to 2013. However, there appears to be a rise between 2017 and 2019. There was fluctuation in rainfall pattern within the period under study.

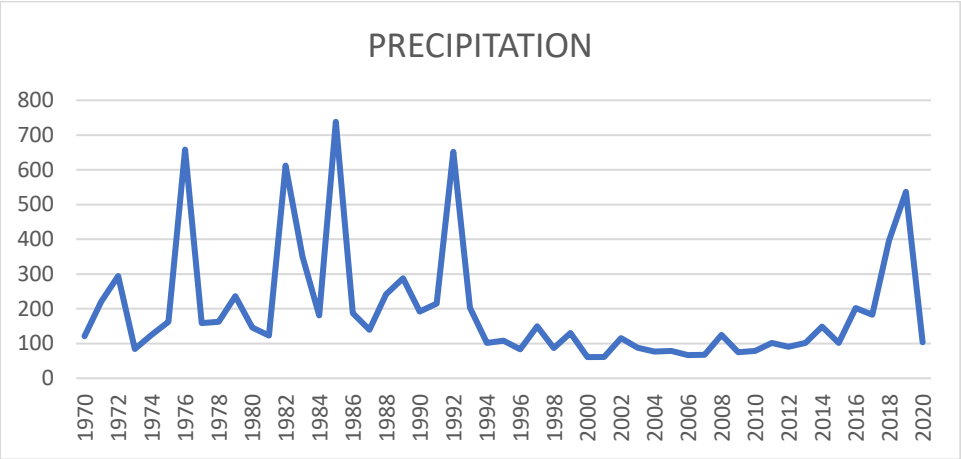


Figure 2: *Precipitation Trend in Nigeria 1970 – 2020*

Maximum, Minimum and Average Temperature Trends

The minimum and the maximum temperature measured in ^{0}C where other climatic factors took into consideration. The trends of the maximum and minimum temperature in Nigeria from 1970 to 2020 are shown in figures 3 and 4 respectively.

Maximum Temperature

Figure 3 represents a graphical representation of maximum temperature in Nigeria from the year 1970 to 2020. The maximum temperature reached its highest in the years 1973, 1987, 1998, 2009-10, and 2016 at 33.36, 33.55, 33.47, 33.83, and 33.69 ^{0}C respectively. These values coincide with some of the years of decrease in amount of rainfall recorded. This increase may be as a result of increase solar radiation, decreases in humidity and rainfall. The lower the rainfall, the higher the increase in temperature. The country also recorded decrease in maximum temperature in the years 1975, 1989, 1992, and 1994 at 32.22, 32.49, 32.51 and 32.58^{o}C respectively with 1975 being the lowest maximum temperature experienced. A steady increase in maximum temperature has been recorded since then up to year 2020. The mean and standard deviation of maximum temperature in the country over the period of study (1970-2020) are 33.08^{0}C and 0.40^{0}C respectively. The standard deviation shows that there is considerable variability in maximum temperature within the period.

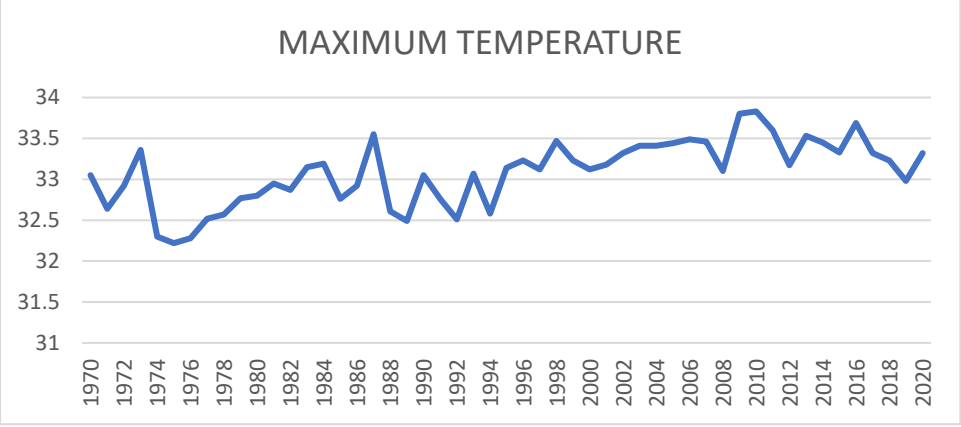


Figure 3: *Maximum Temperature Trend in Nigeria 1970 – 2020*

Figure 4 shows the trend of minimum temperature in Nigeria from 1970 to 2020. Base on the graph, the minimum temperature values were recorded in the years 1971, 1973-

74 and 1989. The values in all these years were below 20.5°C. There were sudden shocks in the minimum temperature in the years 1989 and 2000 representing 4.1% and 3.9% decrease respectively in the minimum temperature. This shock may be likened to unsteady weather condition in the country. After 1989, the minimum temperature steadily increased from 1990 to 2020 (21.41 °C to 21.6 °C). The highest minimum temperature was recorded in the year 2010 and 2016 at 21.94°C and 21.95°C respectively. The mean and standard deviation of minimum temperature in the country over the period of study (1970-2020) are 21.18^0C and 0.41^0C respectively. The standard deviation shows that there is considerable variability in maximum temperature within the period.

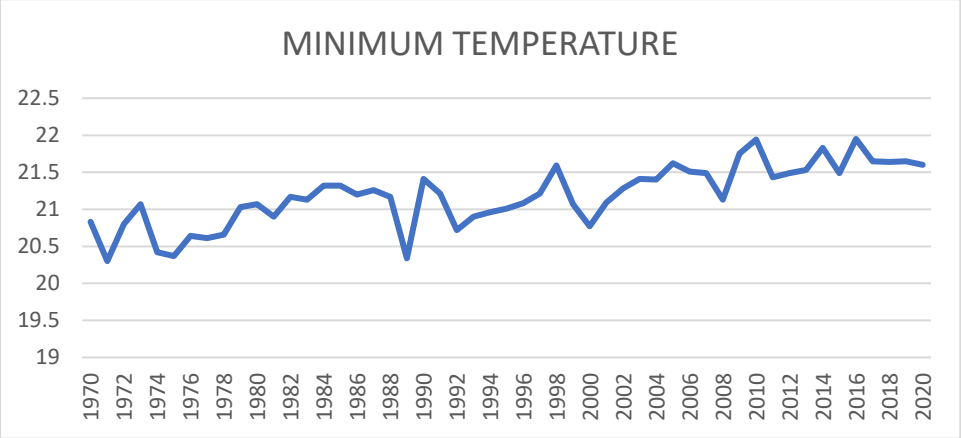


Figure 4: *Minimum Temperature Trend in Nigeria 1970 – 2020*

Figure 5 shows the trend of average temperature in Nigeria from 1970 to 2020. Base on the graph, the minimum average temperature values were recorded in the years 1971, 1973-74 and 1989. The values in all these years were below 26.5°C. There were sudden shocks in average temperature in 1989, representing 3.75% decrease in the average temperature. As explained earlier, this shock may be likened to unsteady weather condition in the country. After 1989, the minimum temperature steadily increased from 1990 to 2016 (27.2 °C to 27.79 °C) representing 5.3% increase. The highest average temperatures were recorded in the years 2010 and 2016 at 27.86°C and 27.79°C respectively. The mean and standard deviation of average temperature in the country over the period of study (1970-2020) are 27.11^0C and 0.39^0C respectively. The standard deviation shows that there is considerable variability in maximum temperature within the period.

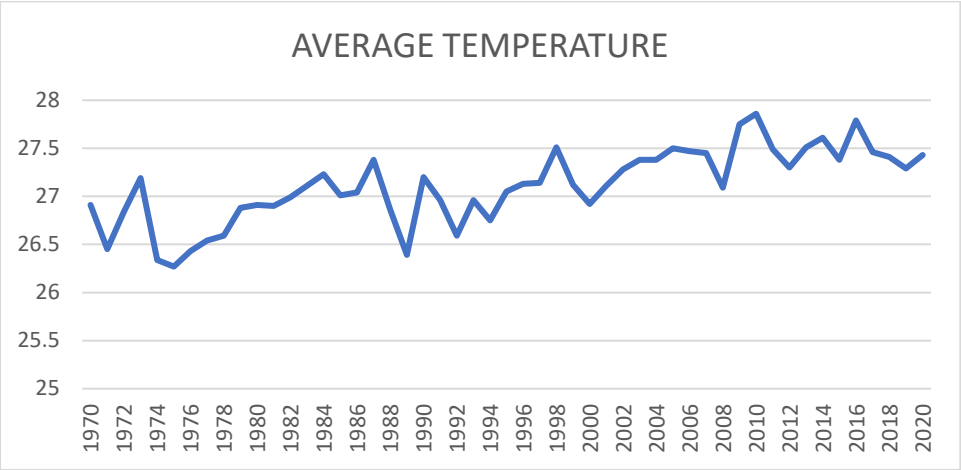


Figure 5: *Average Temperature Trend in Nigeria 1970 – 2020*

Relative Humidity

The relative humidity represents the amount of water vapor in the atmosphere in a particular area. The effect of relative humidity on the growth of a particular crop cannot be over looked. Figure 6 represents the trend in relative humidity of Nigeria. The graph shows that there is no stable pattern of humidity experienced in the country. There was upsurge in the relative humidity in years 1976, 1978, 1986, 1988, 1991, 2012 and 2019 reaching 61.77, 60.59, 58.03, 58.11, 59.71, 59.81 and 59.86cmHg respectively. This increase may be associated to increase rainfall in some of the years especially 1976 and 2019. Also, the relative humidity reached its lowest values in the years 1983, 1987, 1989 and 2015. These are found to coincide with years of lowest precipitation especially 1987, 1989 and 2015. The mean and standard deviation of humidity in the country over the period of study (1970-2020) are 57.72cmHg and 1.58cmHg respectively. The standard deviation shows that there is considerable variability in maximum temperature within the period.

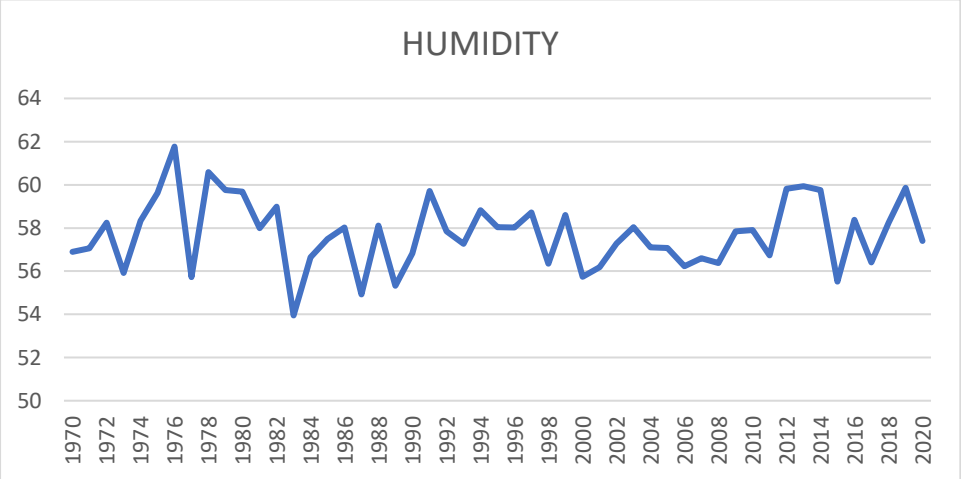


Figure 6: *Humidity Trend in Nigeria 1970 – 2020*

Rice Production Trend

Figure 7 indicates that there is an increase in the rice output steadily from 1970 to 2020. It reached its peak (8.4 metric tonnes) in 2019. The steady increase could be as a result of sustained government policy on the need to become self-sufficient in rice production in the country. The observed increase in the pattern of rice production in Nigeria over five decades was largely due to the increase in acreage of land devoted to rice subsector. Thus, rice fields in Nigeria are

bound to contract with attendant income, employment, foreign trade and food self-sufficiency implications.

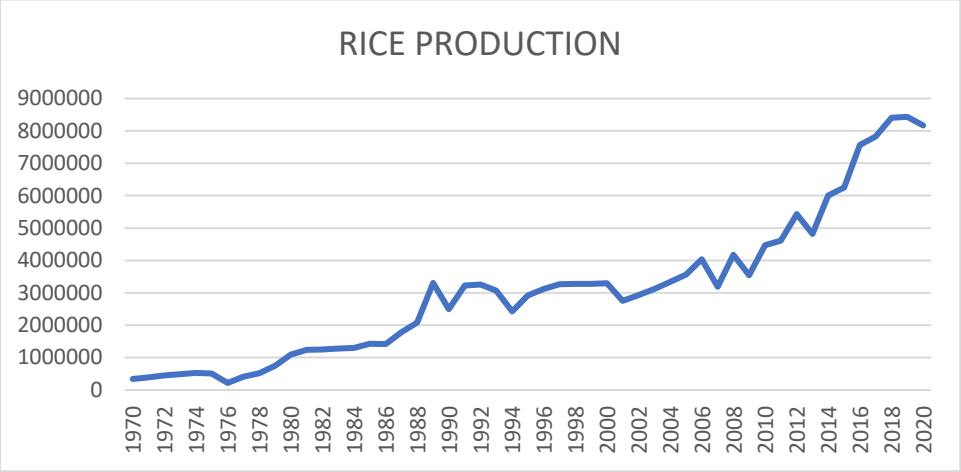


Figure 7: *Rice Production Trend in Nigeria 1970 – 2020*

Rice Yield Trend

Figure 8 indicates an inflationary trend in rice yield from 1970 to 2020. It reached its peak (about 2.4 tonnes per hectare) in 1987. The inflationary trend could be as a result of unstable government policy within the period under consideration. After 1987, the yield fell considerably to as low as 1.3 tonnes per hectare in 2007. The average yield in rice was within the period under consideration was 1.72 tonnes per hectare. Nigeria rice yield in 2020 was 1.55 tonnes per hectare. This is relatively low compared to other African countries such as Egypt (8.8 tonnes per hectare) and Mauritius (5.3 tonnes per hectare). African average yield is 2.2 tonnes per hectare in the same period (FAOSTAT, 2022). Thus, rice yields in Nigeria are relatively low compared to many other African countries. This implies that the country is still undeveloped with respect to improving rice subsector, which if taken seriously has potentials of increasing farm income and employment, as well as enhancing foreign trade and food self-sufficiency.

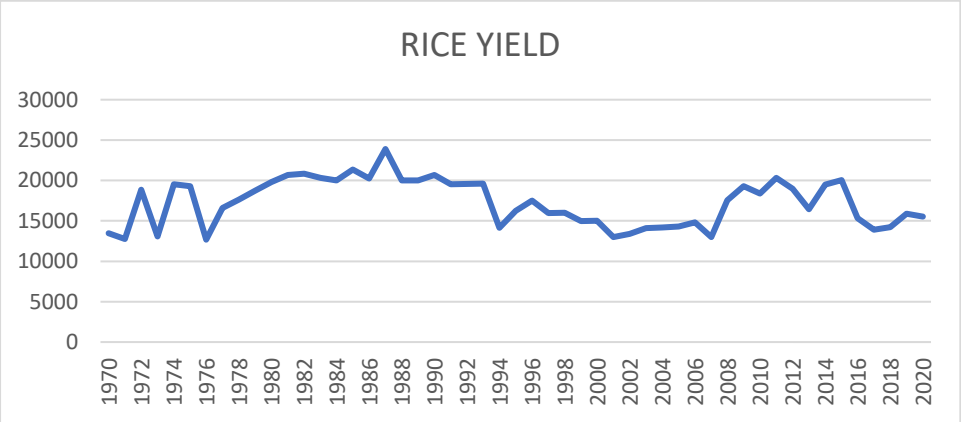


Figure 8: *Rice Yield Trend in Nigeria 1970 – 2020*

Land Area Used for Rice Cultivation

Figure 9 shows that the area of land put to the production of rice in Nigeria increased steadily over the period of study (1970-2020). The area of land put to rice production reduced considerably from 1970

(1.24 million hectares) to 1981 (0.49 million hectares). Afterwards, the land area for rice cultivation in the country increased, reaching its peak in 2019 (2.1 million hectares). Though there was a decline in 2008 and 2009. This increase in rice land acreage might have been due to sustained government policy in this direction. This increase in the area of land put to the production of rice in Nigeria might be the major contribution to increasing trend in production as seen in Figure 7.

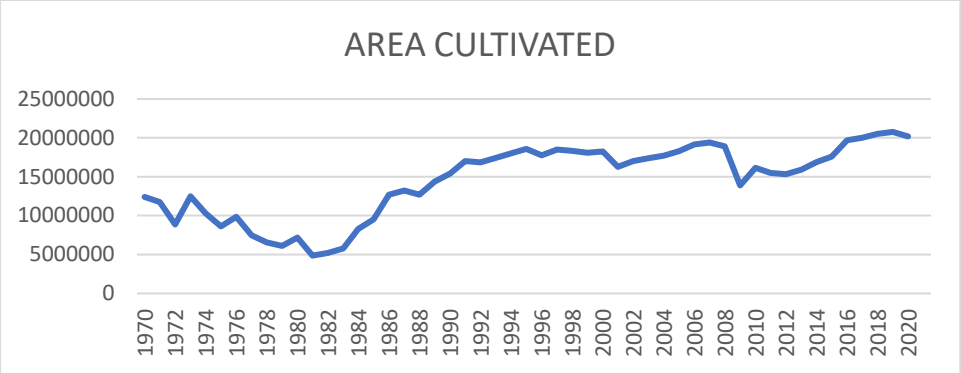


Figure 9: *Cultivated Land Area in Nigeria 1970 – 2020*

Irrigation Utility

Nigeria is so rich in water resources that many of its 36 states are named after rivers. In addition to surface water found in nearly every part of the country, there's also plenty stored in the ground. The country has 215 cubic kilometers a year of available surface water. In spite of this abundant water resources, the country never takes advantage of this natural endowment to develop its agriculture. Figure 10 shows that the best use of water through irrigation was in the year 1981 when only 1.02% of the agricultural land was irrigated. This reduced to 0.63% in 1989, and marginally increased to 0.8% in 2009; this was sustained up till 2020. This implies that most farmers could only cultivate their fields during the rainy season. This makes the farmers and food-insecure populations vulnerable to the changing and unpredictable climate.

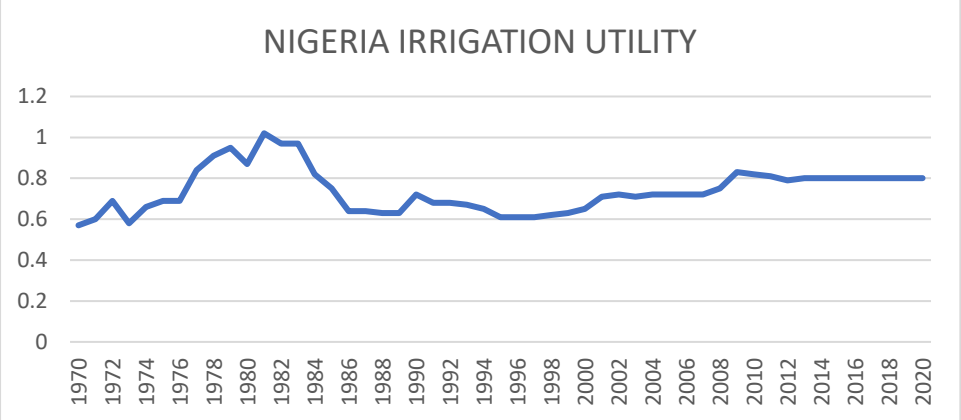


Figure 10: *Irrigation Utility Trend in Nigeria 1970 – 2020*

Nigeria and Global Irrigation Utility Trend Comparison

Figure 11 shows that Nigeria is least in irrigation agricultural development compared to global irrigation utilities. As at 2020, Nigeria has only 0.8% of its agricultural land being irrigated while West Africa sub region has 1.65% of its agricultural land irrigated. This implies that an average West African country was more

than twice better than Nigeria in irrigation agriculture. Furthermore, in 2020 Africa has 6% of its agricultural land being irrigated. In the same period, LDCs, low-income country and the world at large have 11%, 26% and 22% respectively, of their agricultural land being irrigated. This implies that Nigeria is far much behind in taking advantage of irrigation technologies and its abundant water resources. Thereby it would be grossly susceptible to weather and climate vagaries resulting in increased food insecurity.

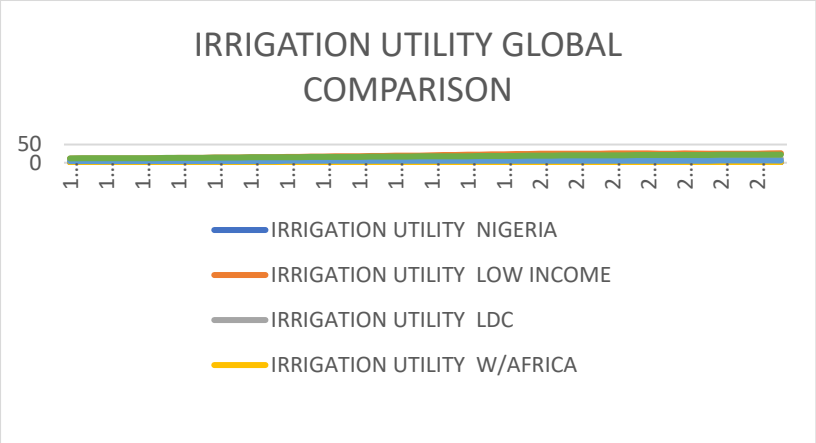


Figure 11: *Nigeria and Global Irrigation Utility Trend Comparison 1961 – 2018*

Existing Relations Among Climatic, Irrigation and Production Variables

The results of correlation matrix that shows the inter-correlations among the variables is shown in Table 1. As expected, there are high positive correlations between the temperature variables. Also, there is negative correlation between humidity and maximum temperature. Similarly, precipitation has negative correlations with temperature variables (maximum and average temperatures). The rate of irrigation utility has high correlations with temperature variables. This suggests that hot climates are being accompanied with use of irrigation infrastructures. Rice yield has positive correlation with precipitation. This implies that increased productivity in Nigeria was mainly due to rain-fed system. Rice output was positively correlated with temperature variables and irrigation utility. This suggests that right combination of temperature and water input through irrigation services contributed to rice production in the country during the period under review.

Table 1

Correlation Matrix Showing the Connections Among the Variables

	Minimum Temp.	**Maximum Temp.**	**Average Temp.**	**Humidity**	**Precipitation**	**Irrigation Rate**	**Rice Yield**	**Rice Output**
Minimum temp.	1							
Maximum temp	0.82**	1						
Average temp	0.96**	0.95**	1					
Humidity	-0.02	-0.32*	-0.18	1				
Precipitation	-0.24	-0.54**	-0.41**	0.27	1			
Irrigation rate	0.68**	0.57**	0.66**	0.07	-0.27	1		
Rice yield	-0.04	-0.15	-0.10	-0.01	0.30*	-0.16	1	
Rice output	0.73**	0.62**	0.71**	-0.12	-0.24	0.62**	-0.01	1

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Climatic Determinants of Rice Production in Nigeria

The results of effects of climatic factors on rice production in Nigeria are shown in Table 2. Regression analysis was carried out to determine these factors. The estimation result from Table 2 reveals that the explanatory variables jointly account for approximately76.3% changes in rice production. The Durbin-Watson statistics illustrate (0.74) absence of auto-correlation. Coincidentally, the goodness of fit for the regression remained low after adjusting for degree of freedom as indicated by the adjusted R^2 (R^2 =58.2%). The result also shows that average temperature, maximum temperature and irrigation utility are statistically significant in explaining changes in rice production as a result of climate change. This therefore implies that 1% increase in average temperature would cause 1.27% increase in rice production in Nigeria, this shows a positive impact. Maximum temperature has a negative effect in that for every 1% increase in maximum temperature there is a decrease of 0.82% in rice production. In this study, irrigation utility has positive effect on rice production. The result implies that 1% increase in irrigation utility would result in 0.25% increase in rice production, Rainfall and humidity are not significant in explaining the effect of climate change in rice production in Nigeria. This result differs from the result of Ayinde *et al*. (2011) where rainfall was significant in explaining the effect of climate change on Nigerian agricultural productivity. It is also dissimilar to the work of Ayinde, *et al.* (2013) where humidity was found to be significant in explaining rice production in Nigeria. However, this study reports similar result as Ayinde, *et al.* (2013) with regard non significance of rainfall in Nigeria rice production. Insignificance of rainfall on rice production may be linked to some varieties of rice that the farmers planted. The use of submergence varieties by some farmers in the regions of the country during occurrence of flood will obviously reduce the negative effect rainfall might have on rice production. In line with this, in seasons where temperature is high and rainfall is very low which leads to drought, the use of drought resistant varieties by the farmers in the country will keep the production level in a stage where maximum temperature and reduction in rainfall will not be significant. These justify the essential of innovative variety to coping with climate variability.

Table 2

Climatic Determinants of Rice Production in Nigeria 1970 – 2020

Variables	**Coefficients**	**t value**	**P-value**
Average temperature	1.268	3.005	0.004**
Maximum temperature	-0.815	-1.847	0.071*
Humidity	-0.160	-1.382	0.174
Precipitation	-0.051	-0.396	0.694
Irrigation rate	0.254	1.890	0.065*
Dependent variable: Rice output			
R^2		0.763	
Adj. R^2		0.582	
Durbin-Watson		0.744	
S.E. of regression		0.649	

*** 1% level of significance*

**10% level of significance*

Conclusion and Implications

Based on the findings of this research, it can be concluded that there is existence of climate change in Nigeria and this is really affecting rice subsector of the country. Rice production in Nigeria is adversely affected by

this climate change as shown by the shocks that exist in the climatic trends. The rice production trend of Nigeria is increasing, but the yield trend is not stable; it has one of the least yields globally. It can also be concluded that the major climatic factors affecting rice production in Nigeria is temperature, such that, the higher the maximum temperature the lower the rice output from Nigeria; and the higher the average temperature, the higher the rice production. Irrigation infrastructure is established in order to ameliorate the effect of climate change. The study has shown that, globally, Nigeria is among the least developed countries with regard irrigation infrastructure development. Irrigation infrastructure is observed to be crucial in enhancing rice production in the country.

Recommendations

Based on the result of this study, the following recommendations are made in order to improve rice production potentials of the country:

1. Research should be conducted to find means of reducing the effect of climate change which will in turn improve the rice production and agricultural sector of the country.
2. Breeders should help to develop rice varieties that can survive higher temperature regimes such that increase in temperature in any environment will not have adverse effect on rice production.
3. Irrigation schemes should be aggressively implemented by all stakeholders both at small and larger scale of rice production in order to improve upon rice yield along with increased production in the country.

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