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WORK- SKILL NEEDS IN YAM PROCESSING AND MARKETING ENTERPRISES OF SCHOOL GRADUATES FOR EMPLOYMENT AND POVERTY REDUCTION IN ABIA STATE, NIGERIA

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Abstract
This study was carried out to identify work-skills in yam processing and marketing needed by school graduates in agriculture. The study was carried out in Osisioma-Ngwa Local Government Area of Abia State, Nigeria. Four research questions were answered by the study, while four hypotheses were tested at probability ≤ 0.05 level of significance and relevant degree of freedom. Population for the study was 72 made up of 28 experts in yam processing, 38 experts in marketing of processed yam and 7 lecturers of Food Science and Technology from Abia State Polytechnic. Sample for the study was the entire population because of its manageable size. Instrument for data collection was questionnaire. Data collected were analyzed using weighted mean, standard deviation and t-test. It was found out that 8 work skills in planning for processing of yam tuber, 17 work skills in processing and packaging of processed yam, 9 work skills in planning for marketing of processed yam and 11 work skills in marketing of yam flour were needed by the graduates for employment and to reduce poverty. It was therefore recommended that, the identified enterprise skills be integrated into a training program of skill acquisition centers in the study area by relevant stakeholders, for training the unemployed graduates for an employment to earn a living and reduce poverty.

Key words: Work-skills, Yam, Processing, Marketing, Enterprises, School graduates, Poverty

Introduction

Yam (*Dioscorea spp.*) is a perennial herbaceous plant that is cultivated for its tubers. Center for Agriculture and Bio resources – CABI (2017), stated that yam is a plant species in the genus *Dioscorea*, and is a perennial herbaceous vine cultivated in many temperate and tropical world regions for its starchy tubers. Augustyn (2019) stated that yam is any of several plant species of the genus *Dioscorea* which is grown for their edible tubers, and yams are native to warmer regions of the world with several species cultivated as staple food crops in the tropics. As enumerated by Okpala (2016), the nutritional values of yam include that, it is a rich source of carbohydrate; it contains dietary fiber; calcium, vitamin C, vitamin B1-6, magnesium, protein, iron and vitamin A. It is also a rich source of riboflavin, ascorbic acid, thiamine, selenium, zinc and niacin. Consultative Group for International Agriculture Research – CGIAR (2011) recorded that yam is often pounded into a thick paste after boiling and is consumed with soup. Furthermore, yam tuber can be processed into flour for use in the preparation of the paste (CGIAR, 2011). In the view of Salawu, *et al.* (2014), processing of yam involves washing, slicing, parboiling, drying and milling of dried yam into flour using relevant equipment and machinery. The

importance of processing yam into flour in the opinion of Busie, *et al.* (2017) are that, it reduces the moisture content of yam to ensure that, it is preserved and stored for a long period, and that its nutrient value as food is secured. Yam in the context of this study refers to flour obtained through processing of yam tubers which can be used for food. The processing of yam tubers into flour and its marketing constitutes enterprises each of which an individual can engage in for a living. Dumas (1999) stated that, an enterprise is a business that comprises of the establishments which operate under the ownership and control of a single organization. As recorded by Research Gate (2008) an enterprise is a company with a business concern, especially one involving a partnership of two or more people for profit making. It is a business venture for carrying out business activities which could be manufacturing, trading or service in legal endeavor, and the business company could be a small, medium or large-scale enterprise (Research Gate 2008). As explained by Kehinde et al (2016), small scale enterprise is a privately owned and operated business characterized by a small number of employees and low turnover. A small-scale enterprise in the opinion of Sarokin (2019) is a business marked by a limited number of employees, a limited flow of finances and materials, and there is no single cutoff to distinguish among small, medium, or large-scale businesses; different government agencies and private organizations rely on different sets of criteria when talking about a small enterprise. A 250-person company in an automobile company may be considered small, while a smaller sized firm may be categorized as a medium- scale operation in another sector such as clothing manufacture. Enterprise in the context of this study is a small- scale business organization that is concerned with the processing of yam tuber into flour and marketing of the yam flour. The processing and marketing of yam flour involve some work- skills which can be undertaken by unemployed school graduates.

Work-skills as explained by Olaitan, *et al.* (1999) are practical activities which individuals perform for work to be carried out effectively. In the context of this study, work-skills are practical activities required to be carried out for effective processing, and marketing of yam flour by unemployed school graduates. Unemployed school graduates in this study are individuals who have completed their program of study in secondary school or tertiary institution but are not gainfully employed in any job for earning a living. These graduates though have completed their course of studies in school, still depend on their parents for handouts for survival. This situation is not beneficial to the graduates, parents and the nation. The graduates can be employed if they are exposed to work skills in yam processing and marketing enterprises. In this way, they can earn their living for a sustainable livelihood while poverty is reduced. The general purpose of this study therefore, was to identify the work-skills in yam processing and marketing enterprises needed for employment in agriculture industry for poverty reduction among unemployed school graduates. Specifically, the study sought to identify work-skills in:

a. planning for processing yam tuber;
b. processing and packaging of processed yam;
c. planning for marketing of processed yam; and
d. marketing of processed yam.

Methodology

Four research questions were answered by the study while four hypotheses were tested at $p \leq 0.05$ level of significance and relevant degrees of freedom. Descriptive survey research design supported by function of industry model was adopted for the study. Survey research design in the submission of McClosky in Mathiyazhagen, *et al.* (2010) is a procedure in which data are systematically collected from a population or a sample thereof through some form of direct solicitation, such as face to face interview, telephone interviews or mail questionnaire.

According to the author, it is descriptive in nature, used to collect primary data based on verbal or written communication with a representative sample of individuals or respondents from the target population. In this study, questionnaire was found suitable for use in obtaining information from a sample of a defined population.

Functions of industry in the view of Federal Information Processing Standards-FIPS (1992) is a structured representation of the activities, actions, processes and operations within the modeled system (agricultural industry) or subject area. The purposes of the function model are to describe the functions and processes employed in an industry, assist with discovery of information needs, help identify opportunities and establish a basis for determining products and service costs in the industry (FIPS, 1992). This model is suitable for this study because it made use of activities and processes obtainable from the agriculture industry to identify and confirm procedures that are relevant to prepare the school graduates for employment in the same industry.

This study was carried out in Osisioma Ngwa Local Government Area of Abia State, Nigeria. Population for the study was 72 made up of 28 experts in yam processing, 37 experts in marketing of processed yam in the area of study; and 7 lecturers of Food Science and Technology from Abia State Polytechnic in Aba, Abia State. Sample for the study constituted the entire population of 72 because of its manageable size.

Instrument for data collection was structured questionnaire obtained from literature review and functions of industry. The questionnaire was divided into four sections-A, B, C and D. Section A comprised of 8 items on work skills in planning for processing of yam tubers needed by school graduates for employment towards reducing poverty. Section B comprised of 17 items in processing and packaging of processed yam, Section C comprised of 9 items on planning for marketing of processed yam, Section D comprised of 11 items on marketing of processed yam. Each questionnaire item had a four-point response option of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with a corresponding value of 4, 3, 2 and 1 respectively. The questionnaire items were validated by three experts from yam processing industry in Enugu State. Their corrections were used to improve the questionnaire items.

The internal consistency of the questionnaire was determined through the use of Cronbach alpha method which yielded a coefficient value of 0.85, 0.81, 0.83 and 0.87 for sections A, B, C and D, respectively. The questionnaire items were administered on the respondents through the help of two research assistants and were retrieved within one month for analysis. Weighted mean was used to answer the research questions, standard deviation was used to determine the spread of respondents around the mean of the questionnaire items, while t-test statistic was used to test hypothesis of no significant difference.

To take decision on the weighted mean, the cut-off point of 2.50 obtained from the arithmetic mean of the values of the response options was used. Any item whose weighted mean is 2.50 or above was regarded as an item on which the respondents agreed, while any item whose weighted mean is less than 2.50 was regarded as an item on which the respondents did not agree. In taking decision on the hypothesis of no significant difference, any item with a p-value of 0.05 or above indicates that there is no significant difference in the mean responses of the two groups of respondents; therefore, the hypothesis of no significant difference was accepted for that item. If the P-value of any item is less than 0.05, it indicates that there is a significant difference in the mean responses of the two groups of respondents; therefore, the hypothesis of no significant difference was rejected for that item.

Results

The results for this study were obtained from research questions answered and hypotheses tested.

Research Question 1

What are the work skills needed by unemployed graduates in planning for processing of yam tuber?

Hypothesis 1

There is no significant difference in the mean ratings of the responses of yam processors and lecturers on the work skills needed by unemployed graduates in planning for processing of yam tuber.

Table 1 presents the data for answering research question one and testing the hypothesis.

Table 1

Mean Ratings and t-test Analysis of the Responses of Yam Processors and Lecturers on Work Skills Needed by Unemployed School Graduates in Planning for Processing of Yam Tuber (N = 35; 28 Yam Processors, and 7 Lecturers)

S/N	Item statement	$\bar{X}$	SD	$\bar{X}_P$	$\bar{X}_L$	S^2_1	S^2_2	P-Value	Remark	
	Planning for Yam Tuber Processing:								**RQ**	**H_o**
1	Determine objectives for yam tuber processing	3.18	0.19	3.27	3.14	0.61	0.73	0.08	Agree	NS
2	Review objectives to accommodate demand and supply of processed yam	2.94	0.21	2.97	2.86	0.70	0.76	0.48	"	"
3	Drawa programme of activities for yam tuber processing	3.23	0.17	3.36	3.14	0.54	0.60	0.09	"	"
4	Review the program of activities required to meet changes in demand and supply of processed yam.	3.27	0.24	3.39	3.41	0.36	0.40	0.53	"	"
5	Make suitable budget for yam tuber processing	3.14	0.20	2.96	3.38	0.30	0.53	0.91	"	"
6	Source credit for yam tuber processing enterprise	3.12	0.26	3.22	3.18	0.51	0.58	0.73	"	"
7	Obtain machines, equipment and other relevant materials for yam tuber processing	3.20	0.24	3.38	3.16	0.47	0.52	0.94	"	"
8	State rules and procedures of work activities to be followed by hired laborers	2.98	0.18	3.08	3.12	0.64	0.73	0.47	"	"

Key: $\bar{x}$ = mean for items agreed, SD = Standard deviation, $\bar{x}_P$ = Mean for yam processors, $\bar{x}_L$ = mean for lecturers, S^2 = Variance.

Data on Table 1 revealed that the 8 items had their means ranging from 2.94 to 3.27 and were above the cutoff point of 2.50. This indicated that the respondents agreed that all the eight items are work skills needed by unemployed school graduates in planning for processing of yam tuber. The table also revealed that standard deviation for the eight items ranged from 0.17 to 0.26 which showed that the respondents were close to one another in their responses. It was also shown on the table that the nine items had their P-values greater than 0.05 indicating that there is no significant difference in the mean ratings of

the responses of the two groups of respondents on the work skills needed by unemployed school graduates in planning for processing of yam tuber. Therefore, the hypothesis of no significant difference was up held for the eight items.

Research Question 2

What are the work skills needed by unemployed school graduates in processing of yam tuber and packaging of processed yam for sale?

Hypothesis 2

There is no significant difference in the mean ratings of the responses of yam processors and lecturers on the work skills needed by unemployed graduates in processing and packaging of processed yam for sale

Table 2 presents the data for answering research question two and testing the hypothesis.

Table 2

Mean Ratings and t-test Analysis of the Responses of Yam Processors and Lecturers on Work Skills Needed by Unemployed School Graduates in Processing and Packaging of Processed Yam for Sale (N = 35; 28 Yam processors, and 7 Lecturers)

S/N	Item Statement	$\bar{X}$	SD	$\bar{X}_P$	$\bar{X}_L$	S^2_1	S^2_2	P-Value	Remark RQ	Remark Ho
A	**Skills in Processing of Yam Tuber:**									
1	Wash yam tubers in clean water	2.87	0.33	3.10	2.86	0.46	0.64	0.58	Agree	N.S
2	Peel yam tuber using knife	2.95	0.23	2.96	2.94	0.52	0.55	0.66	"	"
3	Slice peeled yam tubers lightly into pieces using yam slicer	3.17	0.22	3.16	2.98	0.43	0.55	0.57	"	"
4	Wash the sliced pieces of yam properly put sliced yam pieces into a pot for parboiling	2.83	0.20	3.10	2.88	0.48	0.65	0.48	"	"
5	Put sliced yam pieces into a pot for parboiling	3.34	0.30	3.36	3.24	0.42	0.44	0.09	"	"
6	Place the pot containing the sliced yam pieces on a heater	2.98	0.19	2.81	2.99	0.51	0.47	0.62	"	"
7	Parboil sliced yam pieces till it is partially cooked	2.90	0.27	3.14	2.92	0.40	0.47	0.53	"	"
8	Remove parboiled pieces of yam from the pot for drying	3.14	0.20	2.96	3.38	0.30	0.53	0.91	"	"
9	Dry parboiled pieces of yam using yam drier or by keeping under the sun	3.12	0.26	3.22	3.18	0.51	0.58	0.73	"	"
10	Mill dried pieces of yam into flour using hammer mill	3.20	0.24	3.38	3.16	0.47	0.52	0.94	"	"
11	Sieve milled yam flour using sieving machine	2.98	0.18	3.08	3.12	0.64	0.73	0.47	"	"

B	**Skills in Packaging of Processed Yam for Sale:**									
12	Weigh quantity of processed yam (yam flour) to be packaged using weighing machine	3.28	0.24	3.43	3.34	0.57	0.59	0.38	Agree	NS
13	Obtain water proof nylon bags (or any choice containers) for packaging yam flour.	3.29	0.20	3.34	3.26	0.70	0.59	0.50	"	"
14	Brand the nylon bags or containers for identification and recognition.	3.06	0.22	3.16	2.92	0.43	0.62	0.07	"	"
15	Pour a weighed quantity of yam flour into the branded nylon bags.	3.08	0.18	2.97	3.02	0.54	0.65	0.09	"	"
16	Seal the bags containing measured yam flour using sealing machine.	2.95	0.25	3.06	2.87	0.40	0.54	0.67	"	"
17	Store packaged yam flour in a cool, dry place for safety.	3.11	0.28	3.23	3.19	0.68	0.62	0.87	"	"

Key: $\bar{x}$ = mean for items agreed, SD = Standard deviation, $\bar{x}_P$ = mean for processors, $\bar{x}_L$ = mean for lecturers, S^2 = Variance.

Data on Table 2 showed that the 17 items had their means ranging from 2.83 to 3.34. They were above the cutoff point of 2.50 indicating that the respondents agreed that the 17 items are work skills needed by unemployed graduates in processing and packaging of processed yam. The table also revealed that the standard deviation for the 17 items ranged from 0.18 to 0.33 which showed that the respondents were close to one another in their responses. It was also shown on the table that the P-values for the 17 items were greater than 0.05 indicating that there is no significant difference in the mean ratings of the responses of the two groups of respondents on work skills needed by unemployed graduates in the processing and packaging of processed yam flour. Therefore, the hypothesis of no significant difference was upheld for each of the items.

Research Question 3

What are the work skills needed by unemployed graduates in planning for marketing of processed yam (yam flour)?

Hypothesis 3

There is no significant difference in the mean ratings of the responses of marketers of processed yam and lecturers on the work skills needed by unemployed graduates in planning for marketing of processed yam (yam flour).

Table 3 presents the data for answering research question three and testing the hypothesis.

Table 3

Mean Ratings and t-test Analysis of the Responses of Marketers of Processed Yam and Lecturers on Work Skills Needed by Unemployed School Graduates in Planning for Marketing of Processed Yam (N = 44; 37 Marketers of Processed Yam, and 7 Lecturers)

S/N	Item Statement	$\bar{X}$	SD	$\bar{X}_M$	$\bar{X}_L$	S^2_1	S^2_2	P-Value	Remark RQ	Ho
	Skills in Planning for Marketing Processed Yam (Yam Flour):									
1	Determine objectives for sale of processed yam	3.28	0.24	3.43	3.34	0.57	0.59	0.38	Agree	NS
2	Review the objectives regularly to accommodate changes in the taste of consumers	3.29	0.20	3.34	3.26	0.70	0.59	0.50	"	"
3	Draw a programme of activities for sale of processed yam	3.06	0.22	3.16	2.92	0.43	0.62	0.07	"	"
4	Review the existing programme regularly to accommodate modifications where necessary	3.08	0.18	2.97	3.02	0.54	0.65	0.09	"	"
5	Make a budget for financing the sale of processed yam	2.95	0.25	3.06	2.87	0.40	0.54	0.67	"	"
6	Source for fund for financing activities for sale of processed yam	2.83	0.20	3.10	2.88	0.48	0.65	0.48	"	"
7	Provide relevant materials, machines and equipment for sale of processed yam.	3.34	0.30	3.36	3.24	0.42	0.44	0.09	"	"
8	Check on-line and off-line for individuals and companies interested in processed yam product.	2.98	0.19	2.81	2.99	0.51	0.47	0.62	"	"
9	Make contact with individuals and companies interested in processed yam product.	2.90	0.27	3.14	2.92	0.40	0.47	0.53	"	"

Key: $\bar{x}$ = mean for items agreed, SD = Standard deviation, $\bar{x}_M$ = mean for marketers of processed yam, $\bar{x}_L$ = mean for lecturers, S^2 = Variance.

Data on Table 3 revealed that the nine items had means ranging from 2.83 to 3.34 and were above the cutoff point of 2.50. This indicated that respondents agreed that the nine items are the work skills needed by unemployed graduates in planning for marketing of processed yam. The data also revealed that the standard deviations for the nine items ranged from 0.18 to 0.30 which indicated that the respondents were close to one another in their responses. On the table, it was revealed that the p-values for the nine items were greater than 0.05 indicating that there is no significant difference in the mean ratings of the responses of the two groups of respondents on the work skills needed by unemployed graduates in planning for marketing of processed yam. Therefore, the hypothesis of no significant difference was upheld for each of the items.

Research Question 4
What are the work skills needed by unemployed graduates in marketing of processed yam (yam flour)?

Hypothesis 4
There is no significant difference in the mean ratings of the responses of marketers of processed yam and lecturers on the work skills needed by unemployed graduates in marketing of processed yam (yam flour).

Table 4 presents the data for answering research question four and testing the hypothesis.

Table 4
Mean Ratings and t-test Analysis of the Responses of Marketers of Processed Yam and Lecturers on Work Skills Needed by Unemployed School Graduates in Marketing of Processed Yam (Yam Flour) (N = 44; 37 Marketers of Processed Yam, and 7 Lecturers)

S/N	Item Statement	$\bar{X}$	SD	$\bar{X}_M$	$\bar{X}_L$	S^2_1	S^2_2	P-Value	Remark RQ	Remark Ho
	Skills in Marketing of Processed Yam:								Agree	NS
1	Survey market for information on demand and supply of processed yam	3.28	0.23	3.22	2.96	0.45	0.55	0.64	"	"
2	Identify market for the sale of processed yam	3.18	0.28	3.32	2.88	0.41	0.46	0.73	"	"
3	Locate buyers of processed yam	3.25	0.22	3.32	3.30	0.56	0.50	0.65	"	"
4	Sort packaged processed yam into various sizes based on categories of buyers or consumers	3.10	0.26	3.08	2.81	0.47	0.52	0.6	"	"
5	Fix prices on packaged yam flour based on weight	2.95	0.20	2.88	3.11	0.70	0.51	0.57	"	"
6	Advertise processed yam for sale through on-line media such as whatsapp, facebook, twitter and others	3.37	0.19	3.24	3.36	0.51	0.53	0.87	"	"
7	Advertise processed yam for sale through media such as newspaper, radio and television	2.84	0.28	2.93	3.13	0.71	0.63	0.58	"	"
8	Negotiate with grocery shopkeepers of mini-shops, superstores, supermarkets, shopping malls and others for the advertisement and sale of processed yam	3.13	0.26	3.09	3.28	0.48	0.60	0.46	"	"
9	Transport well packaged processed yam safely to points of sale or to customers	2.97	0.20	2.89	2.94	0.71	0.64	0.52	"	"
10	Keep record of production cost, profits and losses	3.32	0.19	3.32	3.19	0.40	0.56	0.09	"	"
11	Keep record of processed yam sold, unsold, and consumed by your family	3.08	0.18	2.97	3.02	0.54	0.65	0.09	"	"

Key: $\bar{x}$ = mean for items agreed, SD = Standard deviation, $\bar{x}_M$ = mean for marketers of processed yam, $\bar{x}_L$ = mean for lecturers, S^2 = Variance.

Data on Table 4 revealed that the 11 items had means ranging from 2.84 to 3.37, which were above the cutoff point of 2.50 indicating that the respondents agreed that the 11 items are work skills needed by unemployed graduates in marketing of yam flour. The table also revealed that standard deviation for the 11 items ranged from 0.19 to 0.28 indicating that the respondents were close to one another in their responses. It was revealed on the table that the p-values for the 11 items were greater than 0.05 which indicated that there is no significant difference in the mean ratings of the responses of the two groups of respondents on the work skills needed by unemployed graduates in marketing of yam flour. The hypothesis of no significant difference was therefore upheld for each of the items.

Discussion of Findings

Result of the study on Table 1 revealed that eight work skill items were needed by unemployed graduates in planning for processing of yam tuber. The enterprise skills include: determine objectives for yam tuber processing; review objectives to accommodate demand and supply of processed yam; make appropriate budget for yam tuber processing; source credit for yam tuber processing enterprise; and others. The results agree with the opinion of Olaitan et al (2001) who stated that planning activities for any project involves the formulation of specific objectives; review of the objectives periodically; drawing up program plan for the business; and others. The result is in agreement with the finding of Jeseviciute-Ufartiene (2014) in a study on importance of planning in management developing organization, where it was stated that planning was necessary for projecting ideas into the future for the business; set objectives to be achieved in a business; review the set objectives regularly to accommodate changes in the business; identify product users; and others.

Result of the study on Table 2 revealed that 17 work skills were needed by unemployed graduates for processing and packaging of processed yam. The enterprise skills include: wash yam tubers in clean water; peel yam tuber using knife; put sliced yam into a pot; place the pot containing sliced yam pieces on a heater; and others. The result of the study is in line with the finding of Adiaha (2017) in a study on complete guide to agricultural product process and storage. Items identified in the guide include: washing or cleaning of agricultural produce to mill; mill agriculture produce using hammer mill for easy handling and usability; dry agricultural produce using dryer for better storage; and others.

Result of the study on Table 3 revealed that nine work skills were needed by unemployed graduates in planning for marketing of processed yam. The enterprise skills include: determine objectives for the sale of processed yam; review the objectives regularly to accommodate changes in the taste of consumers; draw a program of activities for the sale of processed yam; and others. This result is in conformity with the finding of Okafor et al (2010), where it was found out that unemployed and interested secondary school graduates required 10 entrepreneurial skill items in planning for processing and marketing of palm oil. The entrepreneurial skill items include: formulate the objectives of palm oil processing enterprises; review the formulated objectives with changes in innovation of palm oil processing; decide method of processing to use (manual or mechanical); and others.

Result of the study on Table 4 showed that 11 work skills were needed by unemployed graduates for marketing of processed yam. The work skills include: survey market for information on demand and supply of processed yam; identify market for sale of processed yam; locate buyers of processed yam; fix prices on packaged yam flour based on weight; and others. This finding is in line with the finding of Okafor, *et al.* (2010), where it was found out that secondary school graduates in the study area required 8 work skills in marketing of cassava products. The work skills include: advertise cassava products; carry out market survey to

find out cost of different quality of cassava in the market; carry out market survey to identify measures used and prices attached; and others. The findings of the authors cited help to validate the results of this study.

The result of the hypothesis tested showed that there is no significant difference in the opinions of the two groups of respondents on work skills needed by unemployed graduates in planning for processing of yam tuber, processing of yam tuber, planning for marketing of processed yam and marketing of processed yam (yam flour).

Conclusion and Recommendation

This study was carried out to identify work skills in yam processing and marketing enterprises needed by unemployed graduates for employment to reduce poverty. It was found out from the study that 8 work skill items in planning for processing of yam tuber, 17 work skill items in processing and packaging of processed yam (yam flour), 9 work skill items in planning for marketing of processed yam (yam flour) and 11 work skill items in marketing of processed yam (yam flour) were needed by the graduates for employment, and to reduce poverty.

It was therefore recommended that, the identified work skills in yam processing and marketing be integrated into a training program of skill acquisition centers in the study area by relevant stakeholders, for training the unemployed graduates for job to earn a living and reduce poverty.

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PRODUCTION TASKS NEEDED BY SERICULTURISTS FOR GLOBAL CLIMATE CHANGE AND FOOD SECURITY IN BENUE STATE

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Abstract
This study was conducted on production tasks needed by sericulturists for global climate change and food security in Nigeria. It adopted descriptive survey design. The population for the study was 73. The instrument for data collection was a 50-item structured questionnaire titled: Sericulture Production Questionnaire (SPQ). It was validated by three (3) experts from the Departments of Vocational Agricultural and Technology Education, Crop production, and Animal Production all from the Joseph Sarwuan Tarka University, Makurdi, Nigeria for content and face validity. Corrections and observations made by experts were used to produce the final copy of the questionnaire. The instrument was trial tested in North-East, Nigeria. Cronbach Alpha reliability method was used to determine the internal consistency of the instrument and reliability coefficient of 0.87 was obtained. Mean was used to answer research questions, while t-test statistics was used to test the hypotheses at 0.05 level of significance. The findings of the study showed that sericulture is an agro-based, labour intensive and export-oriented industry that can create millions of jobs in the industry either directly or indirectly for unemployed graduates, youths, women, retirees among others. The study recommended among others that waste dumps or sites should be given to interested farmers for silk production as this will reduce environmental pollution, establishment of mulberry farm, rearing of silkworms and post-cocoon operations should be made available on social media like: facebook and whatsapp that sericulturist and other people interested in going into silk production will get first hand and reliable information on its modern way of production.

Keywords: Sericulture, Production, Global Climate Change, Food Security

Introduction

Sericulture is the breeding and management of silkworms for the commercial production of silk, sericulture is an agroforestry under agrosilvopastoral system of agriculture that involves the raising of food plants for silkworm, rearing of silkworm for production of cocoons, reeling and spinning of cocoon for production of yarn for value added benefits such as processing and weaving (Murugesh, 2019)**.** Silk is believed to have originated from China as early as the Neolithic period, and has become an important cottage industry in countries like Brazil, China, France, India, Italy, Japan, Korea, Russia and Nigeria. China and India are the two main producers, with more than 60% of the world's annual production (Vainker, 2004). Oluwayemisi (2015) asserts that, although there are several commercial species of silkworm, *Bombyx mori* (the caterpillars of the domesticated silk moth) is the most widely used and intensively studied silkworm.

In Africa, the earliest accounts of silk making are documented in Madagascar and South Africa. The reason why Madagascar is one of the earliest locations is because it is the only place where the mulberry trees on which the worms feed are grown naturally. (Department of Sericulture, DOS, 2011). In Nigeria, silk production is an agro-based labour intensive and export oriented mostly rural based cottage industry. It has been a source of improving socio-economic conditions of rural populations ever since its discovery. It is essentially a village based and welfare-oriented industry capable of

providing employment to large sections of population and is primarily produced by Yoruba people where cocoon is used for weaving with obeche (*Triplochyton sclerexylon*) (Oluwayemisi, 2015). Silk production now is at low production in Nigeria, the rearing of silkworm cocoon and silk production is relatively new (Adeduntan, 2013).

According to Sahaf and Mashood (2009), there are four (4) types of silk produced globally: Mulberry silk, Tassar silk, Eri silk and Muga silk. The insects which are responsible for the production of these silk and their host plants are: Mulberry silk with the insect *Bombyx mori* and host plants: *Morus alba*, *M.indica*, *M.laevigata* and *M.serrata* Tassar silk, with the insects *Antheraeamylitta, Antheraeaproylei* and host plant: *Terminaliatomentosa*, *Querusincana* and *Q.serrata*, Eri silk, with the insects *Philosamiaricini* and host plants: *Recinuscommunis* and Muga silk, with the insect *Antheraeaassame* and host plants *Machilusbombycis* and *Litseapolyantha* (Mashood, 2009). The leaves of mulberry plant are used for their diaphoteric and emollient effects, and are also used for making decoction which can be used to gargle to get relief from throat inflammation. The fruit of the mulberry plants are used to treat sore throat, depression, high fever, and is also a coolant and laxative. The root extract has hypoglycemic properties, the root back is used as an anthelmintic, purgative and vermifuge. Mulberry root juice is used to treat high blood pressure, and the milky latex is used as a plaster for sores and for preparation of dermal creams (Sahaf & Mashood, 2009). Sericulture production is an important crop enterprise which generates employment not only at the stage of the production of mulberry leaves, but also at the stage of rearing silkworms.

Climate change and global warming are often used interchangeably (Manstrandrea & Schneider, 2009). Global warming refers to surface temperature increases, while climate change includes global warming and everything else that affects the increase of greenhouse gas. The Intergovernmental Panel on Climate Change (IPCC, 2014), defined climate change as statistically significant variations that persist for an extended period, typically decades or longer. Manstrandrea and Schneider (2009), sees global climate change as a long-term alteration in global weather patterns such as increases in temperature and storm activity, often linked to the potential consequence of rising levels of heat trapping gases known as greenhouse gases which retain the radiant energy provided to the earth by the sun in a process known as the greenhouse effect. Some of the causes of global climate change include: deforestation, ozone layer depletion, increased in carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), greenhouse gas emission into the atmosphere, and unhealthy agricultural practices like burning crop residue (Manstrandrea & Schneider, 2009; Paehler, 2009). The causes of global climate change also led to food insecurity, and for the country to be food insured, the causes of global climate change will be checked.

Food security is a situation in which people at all level have access to good food for healthy living at all time. Food insecurity exists when poverty and managerial shortfall hinders access to capital, land and agricultural inputs. Food security connotes food availability, accessibility and affordability of food, dietary needs of the populace and clothing. Therefore, sericulture can generate both direct and indirect employment to unemployed youths, graduates, farmers, women, retirees among others in the areas of mulberry leaf growing, cocoon rearing among others for food security; hence the study seeks to determine sericulture production.

Purpose of the Study

The main purpose of this study is to determine production tasks needed by sericulturists for global climate change and food security in Nigeria. Specifically, the study sought to determine:

i. cocoon task operations needed by sericulturists;

ii. cooking cocoon task operations,
iii. drying cocoon operations; and
iv. post-cocoon task operations needed by sericulturists for food security in Benue State.

Research Questions

In line with the purposes, the study sought answers to the following questions:

1. What are the cocoon task operations in sericulture production needed for food security?
2. What are the cooking cocoon operations in sericulture production?
3. What are the drying cocoon operations in sericulture production?
4. What are the post-cocoon operations in sericulture production needed by sericulturists for food security in Benue State?

Hypotheses

The following hypotheses were raised and tested at 0.05 level of significance.

Ho_1: There is no significant difference in the mean ratings of the responses of Sericulturist and Agricultural Extension Agents on cocoon operations needed for sericulture production.

Ho_2: There is no significant difference in the mean ratings of the responses of Sericulturist and Agricultural Extension Agents on cooking cocoon operations needed for sericulture production.

Ho_3: There is no significant difference in the mean ratings of the responses of Sericulturist and Agricultural Extension Agents on drying cocoon operations needed for sericulture production.

Ho_4: There is no significant difference in the mean ratings of the responses of Sericulturist and Agricultural Extension Agents on post-cocoon operations needed for sericulture production.

Methodology

The study was guided by four research questions and four hypotheses. It adopted descriptive survey design. The instrument for data collection was questionnaire on a representation for generalization on the entire population. The study was carried out in Benue state, Nigeria. The population for the study was 73 respondents, which comprised of 50 sericulturist and 23 agricultural extension agents. All the population was used because the size was small and manageable to handle by the researchers. The instrument for data collection was a structured questionnaire titled: *Sericulture Production Questionnaire (SPQ)* with a total of 50-items with response options of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). The questionnaire was developed from literature by the researcher and used for data collection. The questionnaire comprised of section A, B, C and D. Section A comprised of 10-items on cocoon operation, Section B comprised of 13-items on drying cocoon operation, Section C comprised of 18-items on cooking cocoon operation and Section D comprised of 9-items on post-cocoon operation. The instrument was validated by three (3) experts, one expert from the Department of Vocational Agricultural and Technology Education, one expert from the Department of Crop Production, and one expert from the Department of Animal Production all from the Joseph Sarwuan Tarka University, Makurdi, Nigeria. Their corrections and suggestions were used to produce the final copy of the questionnaire. The instrument was trial tested in Benue state. Cronbach Alpha (α) reliability formula was used to determine the reliability of SPQ which gave a reliability index of 0.87 indicating that the instrument is reliable. The researcher was assisted by two (2) research assistants who were taught on how to administer and retrieve the questionnaire. A total of seventy-three copies of the questionnaire were administered to the respondents (50 Sericulturist and 23 Agricultural Extension Agents) and retrieved immediately. The data collected was analyzed using weighted mean and standard deviation was used to answer the research questions, while t-test statistic was used to test the null hypotheses at 0.05 level of significance. Any item with a mean score of 2.50 or above was accepted while any item of

with the mean score below the benchmark was rejected.

Table 1

Mean, Standard Deviation and t-test Analysis of Sericulturist and Agricultural Extension Agents on Cocoon Operation Needed in Sericulture Production (N_1=50 Sericulturist, N_2=23 Agricultural Extension Agents)

S/N	Cocoon Operation Ability to:	$\bar{X}_1$	S_1	$\bar{X}_2$	S_2	$\bar{X}_g$	S_g	t-cal	Rmk
1.	Hatch silkworms *Bombyxmori* eggs	3.35	.83	3.20	.79	3.28	.81	1.64	A,NS
2.	Incubate eggs for 9days after hatching	2.98	.73	2.95	.72	2.97	.73	.37	A,NS
3.	Distribute the tiny silkworms to wooden rearing trays to be fed with fresh tender mulberry leaves from the top of the plant six times a day.	3.43	.85	3.35	.83	3.39	.84	.85	A,NS
4.	Chop leaves into various sizes ranging from 0.5cm to 1.0cm for easy feeding by the young silkworms.	3.25	.80	3.11	.76	3.18	.78	1.59	A,NS
5.	Increase the chopped leaves between 1.5cm to 2.0cm as the silkworms develop.	3.38	.84	3.30	.82	3.34	.83	.86	A,NS
6.	Protect the worms from predators by wrapping the trays with small mesh.	3.29	.81	3.25	.80	3.32	.81	.45	A,NS
7.	Divide the colonies into more trays to prevent overcrowding and ensure adequate feeding as the silkworm increase in size.	3.41	.85	3.29	.81	3.40	.83	1.28	A,NS
8.	Cocoon spinning begins with depreciation of food consumption by worms after 22days of rearing.	3.35	.83	3.20	.79	3.28	.81	1.64	A,NS
9.	Pick silkworms about 2days into wooden scaffolding for cocoons uniformity	2.98	.73	2.95	.72	2.97	.73	.37	A,NS
10.	Harvest cocoon after 24days from hatching of silkworms *Bombyxmori* eggs	3.43	.85	3.40	.84	3.42	.85	.32	A,NS

Key: $\bar{X}$1-mean of farmers, $\bar{X}$2-mean of ext. agents, S1-standard deviation of farmers, S2-standard deviation of ext. agents, $\bar{X}$g-grand mean, Sg grand standard deviation, A-greed, NS- not significant, df-71, t-tab-1.98

Data in Table 1 revealed that all 10-items on cocoon operations had their mean values ranging from 2.97 to 3.42 and were above the cut-off point of 2.50. This indicated that the all the 10-items in cocoon production were the production tasks needed by sericulturist in sericulture production. The standard deviation ranged from 0.73 to 0.85, which indicates that the respondents were not too far from the mean and from one another in their response. The results also revealed that the item had t-calculated value of 0.32 to 1.64; this indicates that the item had t-calculated value less than the t-critical value of 1.98.

Table 2

Mean, Standard Deviation and t-test Analysis of Sericulturist and Agricultural Extension Agents on Cooking Cocoon Operation Needed in Sericulture Production (N_1=50 Sericulturist; N_2=23 Agricultural Extension Agents)

S/N	Cooking Cocoon Ability to:	$\bar{X}_1$	S_1	$\bar{X}_2$	S_2	$\bar{X}_g$	S_g	t-cal	Rmk
11.	Arrange three cooking pans for float reeling.	3.28	.81	3.26	.81	3.27	.81	.22	A,NS
12.	Fill the large basins with water at 90 ^{0}C or 95^{0}C in the first and third pan.	3.26	.81	3.21	.79	3.24	.80	.56	A,NS
13.	Maintain the temperature in the second pan at 60 ^{0}C - 65^{0}C	3.05	.75	2.92	.71	2.99	.73	1.58	A,NS
14.	Keep the water in the receiving tough and in cocoon carrier basins at 40^{0}C - 45^{0}C.	3.34	.83	3.29	.81	3.32	.82	.55	A,NS
15.	Take the required quantity of cocoons and place in the wire cage and properly fastened and immersed in the first pan for about 60 seconds.	2.97	.72	2.95	.72	2.96	.72	.25	A,NS
16.	Heat cocoon cavity to expel air	3.15	.77	3.10	.76	3.13	.77	.59	A,NS
17.	Lift cocoon cage briskly out of the pan and immersed in the second pan containing water at 65^{0}C for 30 or 40seconds	2.98	.73	2.95	.72	2.97	.73	.37	A,NS
18.	Loose cocoon shell layer for the hot water to enter through the shell allowing sericin layer and water to partly fill the cocoon cavity	3.43	.85	3.35	.83	3.39	.84	.85	A,NS
19.	Discharge cocoons into the third pan with water at 90 or 95^{0}C	3.25	.80	3.11	.76	3.18	.78	1.59	A,NS
20.	Press down cocoons with special designed water mesh disc.	3.38	.84	3.30	.82	3.34	.83	.86	A,NS
21.	Immerse cocoon in the basin for one to two minutes.	3.29	.81	3.25	.80	3.32	.81	.45	A,NS
22.	Transfer cocoon from the third pan using long handled perforated ladles to the cocoon-receiving trough.	3.41	.85	3.29	.81	3.40	.83	1.28	A,NS
23.	Supply cocoons in small buckets to the reeling basins for brushing and reeling	2.98	.73	2.95	.72	2.97	.73	.37	A,NS

Key: $\bar{X}$1-mean of farmers, $\bar{X}$2-mean of ext. agents, S1-standard deviation of farmers, S2-standard deviation of ext. agents, $\bar{X}$g-grand mean, Sg grand standard deviation, A-greed, NS- not significant, df-71, t-tab-1.98

Data in Table 2 showed that all 13-items on cooking cocoon operations had their mean values ranging from 2.96 to 3.40 and were above the cut-off point of 2.50. This indicated that the all the 13-items in cooking cocoon production were the production tasks needed by sericulturist in sericulture production. The standard deviation ranged from 0.72 to 0.84, which indicates that the respondents were not too far from the mean and from one another in their response. The results also revealed that the item had t-calculated value of -0.22 to 1.59; this indicates that the item had t-calculated value less than the t-critical value of 1.98.

Table 3

Mean, Standard Deviation and t-test Analysis of Sericulturist and Agricultural Extension Agents on Drying Cocoon Operation Needed in Sericulture Production (N_1=50 Sericulturist; N_2=23 Agricultural Extension Agents)

S/N	Drying Cocoon Ability to:	$\bar{X}_1$	S_1	$\bar{X}_2$	S_2	$\bar{X}_g$	S_g	t-cal	Rmk
24.	Place cocoon in the drying machine	3.28	.81	3.25	.80	3.27	.81	.33	A,NS
25.	Heat the pupa through the shell	2.97	.72	2.95	.72	2.96	.72	.25	A,NS
26.	Continue cocoon drying gradually till the desired amount of water is evaporated	3.44	.85	3.40	.84	3.42	.85	.42	A,NS
27.	Reduce relative speed of drying until moisture is dried	3.15	.77	3.14	.77	3.15	.77	.46	A,NS
28.	Maintain 115 – 5^0C for hot air drying	3.34	.83	3.32	.82	3.33	.83	.22	A,NS
29.	Maintain 102 - 2^0C for steam heat	3.21	.79	3.17	.78	3.19	.79	.42	A,NS
30.	Reduce finishing temperature gradually from 60^0C in hot air drying	2.98	.73	2.97	.72	2.98	.73	.12	A,NS
31.	Reduce finishing temperature gradually to 55^0C in steam heat drying	3.49	.87	3.47	.86	3.48	.86	.21	A,NS
32.	Maintain relative humidity at 4-5% at the initial stage	3.28	.81	3.25	.80	3.27	.81	.33	A,NS
33.	Increase relative humidity of 16-19% at the later stage.	3.13	.77	3.09	.76	3.11	.77	.47	A,NS
34.	Spread fresh cocoons in thin layers on a plank of wood	2.99	.73	2.95	.72	2.96	.73	.49	A,NS
35.	Expose cocoons to direct sunlight for two to three days	3.18	.78	3.15	.77	3.17	.78	.35	A,NS
36.	Heap fresh cocoons into a basket	3.13	.82	3.28	.81	3.21	.82	.33	A,NS
37.	Steam in small reeling units	3.43	.85	3.45	.83	3.44	.84	.32	A,NS
38.	Use steam chambers for stifling	3.25	.80	3.11	.76	3.18	.78	1.59	A,NS
39.	Kill pupae by steaming within 30minutes	3.31	.82	3.29	.81	3.30	.82	.22	A,NS
40.	Spread cocoons on spacious, well-ventilated shelves and leaves for three to four days prior to reeling	3.43	.85	3.40	.84	3.42	.85	.32	A,NS
41.	Turn cocoons over frequently to prevent growth of mould.	2.97	.72	2.96	.72	2.97	.72	.13	A,NS

Key: $\bar{X}$1-mean of farmers, $\bar{X}$2-mean of ext. agents, S1-standard deviation of farmers, S2-standard deviation of ext. agents, $\bar{X}$g-grand mean, Sg grand standard deviation, A-greed, NS- not significant, df-71, t-tab-1.98

Data in Table 3 revealed that all 21-items on drying cocoon operations had their mean values ranging from 2.96 to 3.44 and were above the cut-off point of 2.50. This indicated that all the 21-items in drying cocoon production were the production tasks needed by sericulturist in sericulture production. The standard deviation ranged from 0.72 to 0.85, which indicates that the respondents were not too far from the mean and from one another in their response. The results also revealed that the item had t-calculated value of 0.13 to 1.59; this indicates that the item had t-calculated value less than the t-critical value of 1.98, thus accepting the null hypothesis.

Table 4

Mean, Standard Deviation and t-test Analysis of Sericulturist and Agricultural Extension Agents on Post-Cocoon Operation Needed in Sericulture Production (N_1=50 Sericulturist; N_2=23 Agricultural Extension Agents)

S/N	Post- Cocoon Ability to:	$\bar{X}_1$	S_1	$\bar{X}_2$	S_2	$\bar{X}_g$	S_g	t-cal	Rmk
42.	Kill pupa in cocoon during stifling using steam or hot air	2.93	.71	2.90	.70	2.92	.71	.38	A,NS
43.	Sort cocoon into different groups based on the cocoon quality	3.05	.75	3.00	.73	3.03	.74	.60	A,NS
44.	Subject good quality cocoons to sustained heat in cocoon cooking	3.17	.78	3.15	.77	3.16	.78	.23	A,NS
45.	Soften hard sericin to unwound easily from the cocoons	2.89	.78	2.86	.69	2.88	.74	.39	A,NS
46.	Remove silk filaments	2.99	.73	2.91	.73	2.95	.73	.12	A,NS
47.	Draw together filament end from about 6 to 12 cocoons simultaneously	3.09	.76	3.07	.75	3.08	.76	.24	A,NS
48.	Impart the reeled silk yarn with twist and double to the desired specification.	3.49	.87	3.47	.86	3.48	.87	.21	A,NS
49.	Open cocoons to remove dead pupa and subject to cooking process	3.51	.87	3.49	.87	3.5	.87	.21	A,NS
50.	Degume before the spun silk moves to the spinning phase	3.31	.82	3.29	.81	3.3	.82	.22	A,NS

Keys: $\bar{X}$1-mean of farmers, $\bar{X}$2-mean of ext. agents, S1-standard deviation of farmers, S2-standard deviation of ext. agents, $\bar{X}$g-grand mean, Sg grand standard deviation, A-greed, NS- not significant, df-71, t-tab-1.98

Data in Table 4 revealed that all 9-items on post-cocoon operations had mean values ranging from 2.88 to 3.48 and were above the cut-off point of 2.50. This indicated that the all the 9-items in post-cocoon production were the production task needed by sericulturist in sericulture production. The standard deviation ranged from 0.71 to 0.87, which indicates that the respondents were not far from one another in their response. The results also revealed that the item had t-calculated value of 0.12 to 0.60; this indicates that the item had t-calculated value less than the t-critical value of 1.98, thus accepting the null hypothesis.

Discussion of Findings

Discussion of the findings of this study was done in order of research questions.

Cocoon Operations in Sericulture Production

Result presented in Table 1 indicated that 10-cocoon operations in sericulture production are: hatching silkworms *Bombyx mori* eggs, incubating the eggs for 9days after hatching, distributing the tiny silkworms to wooden rearing trays to be fed with fresh tender mulberry leaves from the top of the plant six times a day, picking silkworms about 2days into wooden scaffolding for cocoons uniformity and harvesting cocoon after 24days from hatching of silkworms *Bombyx mori* eggs among others. The finding is in consonance with the study of Oluwayemisi (2015) on profitability of cocoon production in Ado-Ekiti where 12-steps where identified in cocoon production, the steps include among others: hatching silkworms *Bombyx mori* eggs, chopping leaves into various sizes ranging from 0.5cm to 1.0cm for easy feeding by the young silkworms, increasing the chopped leaves between 1.5cm to 2.0cm as the silkworms develop and harvest cocoon after 24days from hatching of silkworms *Bombyx mori* eggs among others.

Cooking Cocoon Operations in Sericulture Production

The result in Table 2 showed that 13-cooking cocoon operations in sericulture production include: arranging three pan cooking for float reeling, filling the large basins with water at 90^0C or 95^0C in the first and third pan, keeping the temperature in the second pan at 60^0C to 65^0C, keeping the water in the recovery tough and in cocoon carrier basins at 40^0C to 45^0C, taking the required quantity of cocoons and placing in the wire cage and properly fastened and immersed in the first pan for about 60seconds,heating cocoon cavity to expel air, lifting cocoon cage briskly out of the pan an immersed in the second pan containing water at 65^0C for 30 or 40 seconds, loose cocoon shell layer for the hot water to enter through the shell allowing sericin layer and watering to partly fill the cocoon cavity, discharge cocoons into the third pan with water at 90^0C or 95^0C, press down cocoons with special design water mesh disc, immersing cocoon in the basin for one to two minutes, transferring cocoon from the third pan using long handles perforated ladles to the cocoon recovery tough and supply cocoons in small buckets to the reeling basins for brushing and reeling. The finding is in agreement with the study of Murugesh (2019) on a study of silk reeling and silk fabric manufacture where he outlined 16-items in cooking cocoon as loose cocoon shell layer for the hot water to enter through the shell allowing sericin layer and water to partly fill the cocoon cavity and press down cocoons with special design water mesh disc among others.

Drying Cocoon Operations in Sericulture Production

The result in Table 3 identified 18-drying cocoon operations in sericulture production which include: placing cocoon in the drying machine, heating the pupa through the shell, continuing cocoon drying gradually till the desired amount of water is evaporated, reducing relative speed of drying until moisture is dried, maintaining 115 - 5^0C for hot air drying, maintaining 102 - 2^0C for steam heat, reducing finishing temperature gradually from 60^0C in hot air drying, reducing finishing temperature gradually to 55^0C in steam heat drying, maintaining relative humidity at 4-5% at the initial stage, increasing relative humidity of 16-19% at the later stage, spreading fresh cocoons in thin layers on a plank of wood, exposing cocoons to direct sunlight from two to three days, heaping fresh cocoons into a basket, steaming in small reeling units, using steam chambers for stifling, killing pupae by steaming within 30 minutes, spreading cocoons on spacious well-ventilated shelves and leave for three to four days prior to reeling and turning cocoons over frequently to prevent growth of mould. The finding is in consonance with the study of Padaki, *et al.* (2015) on enzyme application in silk processing that reduce relative speed of drying until moisture is dried, maintain 115 - 5^0C for hot air drying, maintain 102 - 2^0C for steam heat, reduce finishing temperature gradually from 60^0C in hot air drying are some of the processes for drying cocoon production among others. The finding is also in agreement with the study of Ayoade, *et al.* (2014) in a study on isolation, identification, antibiogram and characterization of bacterial pathogens of the silkworm Bombyx *mori*. The bacterial species isolated from the insect samples in this study were identified as follows: *Bacillus bodius, Citrobacter freundii, Citrobacter amalomaticus, Enterobacter cloacae, Staphylococcus epidermidis and Serratia marcescens.* Results confirms the superiority of individuals of the hybrid strain to the Akure-China and Akure-Japan strain when evaluated for their ability to prevent multiplication of pathogenic bacteria, an essential requirement for resistance to infection. Although, flacherie-causing organisms are present in the insect population, an outbreak will be avoided if proper hygiene is maintained by the farmers, ensuring that insects are reared under optimum conditions for productivity.

Post-Cocoon Operations in Sericulture Production

The result in Table 4 revealed 9-post-cocoon operations in sericulture production like: killing pupa in cocoon during stifling using steam or hot air, sorting cocoon into different groups based on the cocoon quality, opening cocoons to remove dead pupa and subject to cooking process and degum before the spun silk moves to the spinning phase among others. The findings of this study were in agreement with the findings of Naskar, Barua, Ghosh and Kundu (2014) in a study on the introduction to silk biomaterials, the authors identified the above steps in post-cocoon operation for silk production. The findings of this study were also in agreement with the findings of Adeduntan (2015) in a study on the influence of different varieties of mulberry leaves (*Morus alba*) on growth and cocoon performance of biovoltine strain of silk worm (*Bombyx mori*) the author x-rayed the influence of different varieties of mulberry leaves used as feed on mortality and cocooning of silkworm as well as on cocoon qualities (good cocoon, flimsy cocoon, stained cocoons, cocoon shell weight and pupa weight), the effects of anti-nutrients presents on the variety mulberry leaves used as feed on silkworm performance were further x-rayed. The findings of the authors cited above helped to strengthen the validity of the findings of this study.

Conclusion

Sericulture is an agro-based, labour intensive and export-oriented industry that can create millions of jobs in the industry either directly or indirectly for unemployed graduates, youths, women, retirees among others.

Recommendations

1. High quality seeds should be produced and sold at affordable rates to encourage sericulture production.
2. Agricultural extension agents should organize seminars, conferences and workshops at the door steps of farmers and those interested in going into sericulture as this will also improve the production.
3. Waste dumps or sites should be given to interested farmers for silk production as this will reduce environmental pollution.
4. The establishment of mulberry farm, rearing of silkworms and post-cocoon pertains should be made available on social media like: facebook and watsapp that sericulturist and people interested in going into silk production will get first hand and reliable information on its modern way of production.

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GROWTH AND YIELD PARAMETERS OF ORANGE FLESHED SWEET POTATO (OFSPO- MOTHER DELIGHT, UMUSPO 3) IN OMOKU, RIVERS STATE, NIGERIA

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Abstract
The study was aimed at determining the effect of vine length on growth and yield of orange fleshed sweet potato (OFSP-Mother delight, UMUSPO 3) in tropical soil. The study was conducted at the Teaching and Research Farm, Federal College of Education (Technical) Omoku, Rivers State, Nigeria during the early farming season of 2022. The design adopted for the study was randomized complete block design (RCBD) with three treatments (15, 30 and 45 cm vine length) each replicated four times and lasted 90 days, planted at a distance of 100cm by 75 cm. Weeding was done once and data were collected on the following variables sprouting, number of leaf and branches, vine length, fresh tuber yield and fresh forage yield. The data were summarized and subjected to mean, percentage and analysis of variance. It was observed that the sprouting percentage was more than 50% in all the treatments from the first one week after planting (WAP) and continued to about 92% at three WAP (15cm 91.5%, 30cm, 92.75% and 45cm,94.2%). The growth parameters; mean number of leaves, number of branches and vine length showed numerical differences among treatments. The fresh tuber and forage yields were significantly different among treatments at 0.5 % probability. A 30cm vine length differs significantly from 15cm vine length but does not differ from 45cm vine length. It was concluded that the OFSP vine length had unique influence on growth and yield of mother's delight (UMUSPO 3). It was recommended that to enhance food security UMUSPO3 should be cultivated using 30- 45 cm vine length as planting material.

Keywords: UMUSPO 3, Food Security, Vine Length, Yield

Introduction

There is outstanding link between man and his environment to enhance socio-economic wellbeing and satisfy his demand for hunger. Food security is a key factor in human welfare, the awareness, availability, accessibility, affordability and utilization of food account for different nutritional status among individuals. Ukpong (2023) asserted that there is strong relationship between nutrition and healthiness of either man or animal. The consciousness of this fact has made man to explore his environment to harness potential sources of what should be called foodstuffs/feedstuffs. He also made several attempts to modify the genetic adaptation and value chain potentials of already known crops and animals which are used as foodstuffs.

Sweet potato (*Ipomoea batatas* (L.) Lam.) from the family *Convolvulaceae*, is an important food crop that has benefited from genetic improvement programmes to fight hunger and malnutrition. The cultivated varieties of *I. batatas* display an important morphological polymorphism (Sihachakr & Ducreux, 1987). Among the species within the genus Ipomoea series Batatas, thirteen (13) are considered to be closely related to sweet potato (Austin, 1987) Sweet potato varieties and improved lines could be easily identified by colours; tuber skin and flesh; ranging from white to deep purple, although white, yellow and orange -flesh are the most common colours; leaf and vine colours which ranges from deep to light green and deep purple to light purple colourations; the structure of the leaves which may be pinnate or broad (Ukpong, 2023, Hageuimana, *et*

al.,1999). Sweet potato is well known tuber crop in the Sub-Saharan Africa (Low, *et al.*, 2009) and one of the most important versatile food crops. Sweet potato has nutritional advantage for the rural and urban dwellers (Ingabire & Hilda, 2011) and grows in all kinds of marginal soil, wide adaptation with high yielding and high resistance to drought (Lu, *et al*., 2006). Sweet potato roots are rich in starch, sugar, vitamin C, β-carotene, iron, and several other minerals (Laurie, *et al.*, 2012; Oloo, *et al*., 2014). It has high carbohydrate content with a low glycemic index due to low digestibility of the starch making it suitable for diabetic or overweighed people (Ellong, *et al*., 2014; Fetuga. *et al*, 2014; Ooi & Loke, 2013). The root is reported to usually have higher protein content than other roots and tubers, such as cassava and yams (Oloo, *et al*., 2014).

Orange fleshed sweet potato (OFSPO) is a variety of sweet potato that is bio-fortified. It was developed by Centre for International Potato, CIP (van Jaarsveld, *et al*., 2006). In addition to the importance of sweet potato; OFSP has biochemicals potentials to fight mal-nutrition and ill- health in humans particularly among children and women of reproductive age in Nigeria and other third world countries. It improves digestion, weight gain, immune system and prevents vitamin A deficiency. It is antidote for stomach ulcer, diabetes, dehydration, arthritis, bronchitis and inflammation (Mitra, 2012; Ukpong, 2023).

UMUSPO3 (Mother's delight) is one of the biofortified improved line of Orange Fleshed Sweet Potato developed by National Root Research Institute Umudike, Abia State, Nigeria as a genotype in 2013 (Kanu, *et al*., 2018) to meet needs of farmers. The Mother's delight OFSPO has been distributed to farmers in some catchment areas of the Institute for multiplication and cultivation. This effect may not be profitable if adequate studies are not established on various aspects of its cultivation. In the cultivation of mother's delight certain fundamental questions may be asked; which season the best for planting is, what is the ideal length of vine as planting material and what may the effect on growth and tuber yield. The issue of length of planting material is not a common research area in OFSPO studies but a few available studies on planting materials are based on number of nodes (Nwaigwe, *et al*., 2011) which may confuse the OFSPO farmers due to morphological status of the vine influence by soil and other environmental factors. Achebe *et al*. (2021) reported that cutting vine to different lengths have effect on the growth and yield of OFSPO. Achebe et al. (2021) added that cuttings of 25- 30cm perform better and cuttings above 40cm is a waste of planting materials. This study was designed to answer to the question: what is the best vine length as planting material for UMUSPO3 in Omoku, Rivers State?

Methodology

The experiment was carried out at Teaching and Research Farm of Department of Agricultural Education Federal College of Education (Technical), Omoku Rivers State. The experimental design adopted was randomized complete block design (RCBD) with three (3) treatments each replicated four (4) times and experiment lasted 90 days. The treatments were 15cm, 30cm and 45cm vine lengths as planting material. The experiment area measured 30 by 10m was divided into six (6) experimental plots each measuring 5m by 10 m and each plot had eight (8) beds measuring 4 by 1m.

The experimental material- OFSP variety-mother delight vines were obtained from National Root Crop Institute, Umudike, Abia State. The vine lengths of planting material were 15cm, 30cm and 45cm respectively. The planting materials were planted at distance of 0.75m by 1m on raised beds on second week of May 2022. Weeding was done once using hoe and supplying was also done three (3) weeks after planting (WAP). Measurements were collected on growth and yield parameters. The growth parameters were:

i. Rate of sprouting by counting sprouting against non- sprouting at 1, 2 and 3 weeks after planting (WAP).
ii. Number of leaves by counting at 2, 4 and 6 weeks after planting (WAP)
iii. Vine length by measuring with metre rule at 2, 4 and 6 weeks after planting (WAP)
iv. Number of branches by counting at 2, 4 and 6 weeks after planting (WAP)

The yield parameters measured were tuber and forage yields, the measurements were taken immediately after harvest was done. The data collected were summarized and subjected to analysis of variance (ANOVA) at 0.05% probability. The means were separated using Duncan New Multiple Range Test.

Results and Discussion

Effect of Planting Material Lengths on Sprouting Rate of Mother Delight Potato in Weeks After Planting

Data on planting material lengths and sprouting rate are presented on Table 1. At a WAP the rates of sprouting were 52, 55 and 58% for 15, 30 and 45cm respectively and there is no significant difference among treatments. At 2 WAP the sprouting rate increased numerically, 67.2%%, 685% and 68.5% for 15, 30 and 45cm planting material lengths respectively. The data do not differ significantly among treatments. At 3 WAP the sprouting rates were 91.5, 92.75 and 94.2% for 15, 30 and 45cm lengths of planting material. Similarly, there is no significant difference among treatments. It could be adduced that the UMUSPO3 planting materials had a higher sprouting potential. The observed may also be induced by handling and management strategies; the vines were not exposed to direct sun during transit and planted immediately on arrival therefore viability was affected. The different lengths of planting material affect only the numerical increases in sprouting rates that do not show significant differences among treatments means. The findings were consistent with Namo, *et al*. (2017) who reported that cutting sizes determine germination rate of the vines. The findings were at variance with FAO (2010) which reported that shorter cuttings of less than 25cm will take longer time to sprout and also grow slowly.

Table 1

Effect of Cutting Lengths of Planting Material on Sprouting Rate of UMUSPO 3

Variables	1WAP	%	2WAP	%	3WAP	%
15 cm	6.75[a]	52	9.53[a]	67.2	12.09 a	91.50
30 cm	7.33[a]	55	11 00. [a]	68.5	12.59 [a]	92.75
45 cm	7.65[a]	58	11.30[a]	68.8	15.20 [a]	94.20

Means with the same superscript in the same column are not significantly different; WAP is week after planting.

Effect of Planting Material Lengths on UMUSPO3 Growth Parameters

Table 2 shows data on number of leaves, vine length and number of branches at 2, 4 and 6 WAP as affected by planting material lengths. The number of leaves indicates 8.00, 10.00 and 11.00 for 15, 30 and 45cm at 2 WAP, 4 WAP the number of leaves increased to 11.20, 18.00 and 20.00 for 15, 30 and 45 cm and 6 WAP the number of leaves also increased to 26.31, 33.00 and 35.00 for 15, 30 and 45cm respectively.

Table 2
Effect of Planting Material Lengths on Some Growth Parameters at Different Periods

Variable	No of leaves			Vine length			No of branches		
	2WAP	4WAP	6WAP	2WAP	4WAP	6WAP	2WAP	4WAP	6WAP
15 cm	8.00[a]	11.20[a]	26.31[a]	10.10[a]	20.00[a]	34.93[a]	0.00[a]	1.00[a]	1.00[a]
30 cm	10.00[b]	18.00[b]	33.00[b]	12.19[b]	36.11[b]	42.00[b]	0.00[a]	1.00[a]	2.00[b]
45 cm	11.00[b]	20.00[b]	35.00[b]	13.40[b]	38.00[b]	44.00[b]	0.00[a]	1.00[a]	2.00[b]

Means with the same superscript in the same column are not significantly different; WAP is week after planting

The number of leaves does not differ significantly from one another but treatment (15cm) differs significantly from treatment 2 (30cm) and treatment 3(45cm) and 30cm length of material does not differ significantly from 45 cm.

The vine length at 2WAP indicates 10.10, 12.19 and 13.40 cm for 15, 30 and 45 cm lengths of planting material, 4 WAP the vine length shows 20.00,36.11 and 38.00cm for 15,30 and 45cm lengths of planting and at 6 WAP, 34.93,42.00 and 44.00 cm vine lengths are recorded for 15, 30 and 45 cm lengths of planting materials respectively. The vine length did not differ significantly among treatments; 15cm length of planting differs significantly from 30cm and 45 cm lengths of planting materials but 30cm and 45cm lengths planting material did differ significantly from one another. At 2 WAP, the number of branches is zero for all the treatments, 4 WAP each of the treatments had one branch and 6 WAP the number of branches increased numerically, 1, 2, 2, for 15, 30 and 45 cm lengths of planting material. There is significant difference among treatments at 2WAP and 4WAP. At 6 WAP; 15cm length of planting material differs significantly from 30cm and 45cm lengths of planting material but 30cm and 45cm do not differ significantly from one another. The observed may be due to soil and season factors which induce growth. The findings are in tandem with IITA (2011) and Achebe, *et al.* (2021) that cutting sizes of planting material in sweet potato determine growth parameters like number of leaves. The findings are also in line with Namo *et al.* (2017) who asserted that girth of vine, vine length, number of leaves, petiole of the leave and area of leaf OFSPO are influenced by length of planting material.

Effect of planting material lengths on tuber and forage yields of UMUSPO 3

Table 3 shows data on tuber and forage yields of UMUSPO 3 as affected by different lengths of planting material. The tuber yield shows 10.26, 11.12 and 13.30 ton ha $^{-1}$ for 15, 30 and 45 cm respectively. There are significant differences among the treatment differ significantly from 45 cm length of planting materials. The forage yield shows 8.42, 10.37 and 11.78 ton ha^{-1} for 15, 30 and 45cm, respectively.

Table 3
Response of Tuber and Forage Yields to Different Lengths of UMUSPO 3 Planting Material

Variables	Tuber yield (ton^{-1})	Forage yield (ton^{-1})
15cm	10.26[a]	8.42[a]
30cm	11.12[b]	10.37[b]
45 cm	13.30[c]	11.78[b]

Means with the same superscript in the same column are not significantly different.

The fifteen (15) cm length of planting material differs significantly from 30cm length of planting material and 45 m length of planting material in terms of forage yield; while the thirty (30) cm and 45 cm lengths of planting material do not differ significantly from each other. The findings of this study are in consonance with the report of FAO

(2010) and Achebe (2021) who stated OFSPO cutting lengths of 25-30cm planting material is most suitable for growth and yield. The findings are in line with the reports of IITA (2011) and Namo *et al*. (2017) that best planting material cutting sizes for sweet potato is 30cm.

Conclusion

Cutting sizes of planting material influence the growth and yield of UMUSPO 3. From the findings 30cm cutting length and 45cm gave roughly the same growth and yield patterns. It is concluded that the best vine cutting length should be between 30cm and 45cm in Omoku and its environs. It was recommended that 30cm-45cm vine cutting should be used for planting, also planting materials should be highly protected from direct sunshine and also farmers, students, traders and others should cultivate this crop around their houses to enhance family nutrition and well bring.

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ROLE OF AGRICULTURAL EDUCATORS IN PROMOTING FOOD PRODUCTION TO END HUNGER AND REDUCE POVERTY IN OSHIMILI SOUTH LOCAL GOVERNMENT OF DELTA STATE

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Abstract
The study examined the role of agricultural educators in increasing food production to achieve sustainable development goals on poverty and hunger in Oshimili south local government of Delta State with two research questions. Descriptive survey research design was adopted in the conduct of this study. The population for this study consists of Lecturers and all students of Agricultural science in Federal College of Education (Technical) and Dennis Osadebe University (DOU) both in Oshimilli South Local Government area of Delta State. Through the use of simple random sampling technique 138 respondents were selected for the study from the two tertiary institutions namely Dennis Osadebe University, Anwai and Federal College of Education (Technical) Asaba. The collected data were analyzed using mean and standard deviation. The study revealed that agricultural educators promote increased food production which have great impact in reducing food poverty in Oshimili South Local Government Area to a low extent with a cluster mean score of 2.04. The study found that lack of appropriate technologies for processing, packaging, and storage, low rate of technology adoption, lack of information on marketing channels for farmers and processors, poor linkages between research and the food industries, lack of infrastructures, land tenure system and inability to access loan at affordable interest rate affect agricultural science educators in increasing food production to achieve sustainable development goals on poverty and hunger in Oshimili South Local Government with a mean score of 3.14. The study recommends that there is need for a radical change in both curriculum content and delivery; employing modern methods in teaching which seek to develop in the individual appreciation and love for work through knowledge and skill acquisition based on attitudinal change and orientation for food production among others.

Keywords: Agricultural, educators, food, production, hunger, poverty

Introduction

Agriculture according to Federal Government of Nigeria (FGN), in Awotoye, (2020) is the cultivation of plants and husbandry of animals, it is the management of living things and ecosystems to produce goods and services for the people. Agriculture includes cultivation of crops, animal husbandry, aquaculture, horticulture, processing, drying, storage, and marketing of agricultural products. Agriculture remains a key component of Nigeria's economy, and currently contributes about 40% of the GDP and can employ over 70% of the active population, yet the sector has significantly underperformed its potential.

Agriculture is basically practiced for the purpose of producing food and other human needs such as shelter, clothing, medicines, tools, weapons, ornaments and for the foreseeable future and many more items. The food, clothing, material for homes, the gardens, and many of human traditional items and values comes from agricultural sector. It is likewise practiced as a business for human needs and economic gain based on systematized body of knowledge and requires skill (Muhammad, 2014).

Agricultural Educators impart knowledge, skills and attitudes in agriculture to learners at all levels, thereby giving the learners sound academic knowledge, skills

and good opportunity to apply this knowledge into a productive venture. The level of developmental trajectory of any nation depends on her magnitude of agricultural development. No nation can survive let alone develop without the capacity to feed her populace (Odey, *et al*., 2017). Hence, food production is paramount for any nation in need of sustainable economic growth and development. This is because any nation that is economically and politically unstable cannot meet the basic food need for its population both in quality and quantity. This brings to bear the need for applicable skills, knowledge and attitude acquired through agricultural education for the enhancement of food production and sustainable development.

Sustainable development according to the Brundtland Report in Eneji, *et al.* (2021) can be defined as meeting the needs of the present generation without compromising the needs of the future generations. From this definition, sustainable development means development that would better the lives of the people now and in the near future. Also, Awotoye *at al.* (2020) opined that sustainable development is a kind of development that can be initiated and managed properly in such a way as to give attention to continuity and preservation.

Sustainable development on the other hand means continuous development using the earth's resources without destroying the life sustainable properties of the environment (Ojiako, 2008). The Oxford Dictionary of New words third edition (2016), defined sustainable development as being able to sustain (an activity, use of resources etc) over an indefinite period without damage to the environment, permanent depletion of resources etc. Therefore, meeting human needs at all times forms the bedrock for sustainable development. Meeting the goals of sustainable development means satisfying: economic needs, social, cultural and health needs, political needs, it also means: minimizing the use of non-renewable resources, sustainable use of renewable resources e.g. fresh water, soils, forests etc and keeping within the absorptive capacity of local and global sinks of waste (UNESCO in Al-Nuaimi & Al-Ghamdi, 2022).

The Sustainable Development Goals (SDGs) or Global Goals are a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all". The SDGs were set up in 2015 by the United Nations General Assembly and are intended to be achieved by the year 2030. They are included in a UN Resolution called the 2030 Agenda. The SDGs were developed in the post-2015 development agenda as the future global development framework to succeed the Millennium Development Goals which ended in 2015. The 17 SDGs are: no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reducing inequality, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice, and strong institutions, partnerships for the goals.

Agricultural education on the other hand, is defined as a subject of vocational education which is an occupation related training aimed at exposing, inculcating and developing knowledge, practical skills, competencies and attitudes. It provides the right type of skills and knowledge that will make individuals function effectively in any profession or job, and in agricultural related job or career (Egun & Egun, 2015).

Agricultural education as an integral part of vocational education can be described as education for sustainable development. A look at Nigeria per capital GDP and the various components of the agricultural sector shows that agriculture provides about a half and engages two-third of the labour force (Eneji, *et al*., 2021). The status of Agricultural Education in Nigeria is generally ineffective as a lot of agricultural science students and graduates are unable to accomplish simple practical farming activities given the required facilities (Eneji,

et al., 2021). Despite the contributions of agricultural education in the growth and improvement of agricultural production, it has awfully failed to sustain the developmental pace of the nation and hence food security and sufficiency cannot be envisaged in the near future. This is based on the premise that the government at all levels have not equipped agriculturists and farmers with the enabling environment to produce adequate food for both consumption and employment generation and hence promote sustainable development (Eneji, *et al*., 2021).

There is need for our agricultural activities to be sustainable because the population of the country is growing astronomically (presently put at 200 million people) and there is fear that the country will not be able to meet the food need of the nation. This is against the backdrop of most farmlands in Nigeria being degraded by severe soil erosion and desertification, and oil spillage leaving a trail of poverty, hunger, mass migration and internally displaced people. New approaches in agriculture are needed if rural communities are to overcome the increasing food insecurity and poverty. Hence, this study is on the role of agricultural science educators in increasing food production to achieve sustainable development goals on poverty and hunger in Oshimili South Local Government of Delta State.

The social and economic stability of any nation is largely dependent on the ability of that nation to ensure that at all times, its people have both physical and economic access to food that is adequate both quantitatively and qualitatively. Small holder farmers constitute about 80% of all farm holdings, their production system is inefficient, there is regular shortfall in national domestic production. Therefore, food import is a common feature. Agriculture is a key sector that can affect majority of Nigerians so not only small holder farmers should be involved in the production. Agricultural science students are expected to participate in food production to ensure food security, alleviate hunger and poverty in Nigeria, but this is not so because of the way and manner that the course is taught. Although some countries can ensure food security through importation, the most desirable form of food security is self-sufficiency through food production (Kikafunda *et al.,* 2012). Despite various measures taken to alleviate the world hunger problem, food insecurity and under nutrition remain serious problems in Nigeria.

Bearing in mind that agriculture has a much greater impact on reducing hunger poverty and improving food security than the other sectors of the economy and considering differences in the potential for agricultural production in Nigeria, the aim of this study is to identify role of agricultural science education transformation in increasing food production to achieve sustainable development goals on poverty and hunger in Oshimili south local government of Delta State.

Purposes of the Study

The main purpose of the study was to assess the role of agricultural educators in increasing food production to achieve sustainable development goals on poverty and hunger in Oshimili south local government of Delta State.

Research Questions

The following research questions were raised to guide this study

1. To what extent do agricultural educators promote increased food production to achieve sustainable development goals on poverty and hunger in Oshimili South LGA of Delta State?
2. What are the factors affecting agricultural educators' role in promoting increase in food production to achieve sustainable development goals on poverty and hunger in Oshimili South LGA of Delta State?

Methodology

Descriptive survey research design was adopted in the conduct of this study. This research design was adopted because the subject of investigation centers on

individual's opinions, attitudes and perception. The population for this study consists of Lecturers and all students of Agricultural Education in Federal College of Education (Technical) and Dennis Osadebe University (DOU) both in Oshimilli South Local Government area of Delta State. Through the use of simple random sampling technique 138 respondents were selected for the study from two tertiary institutions namely Dennis Osadebe University, Anwai and Federal College of Education (Technical) Asaba. A structured questionnaire was used for data collection. A four - point rating scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE) were used. Respondents were required to respond by placing a tick at the appropriate column. The instrument was validated using face and content validity by two experts from Department of Agricultural Education and one from Department of Measurement and Evaluation all in Federal College of Education (Technical), Asaba. The collected data were analyzed using mean and standard deviation. The Questions were weighted as follows: very high extent, high extent, low extent and very low extent, 4- points, 3 points, 2 points and 1 point respectively. The mean of the scale was computed by adding the values of the response items on the 4-point scale (4+3+2+1 = 10) and divide by 4 to give 2.5. The acceptance point for items was 2.5 and above as any mean below 2.5 was regarded as rejected or disagreed. The standard deviation from the mean was used to determine the closeness or wideness (spread) of the respondents.

Results

Research Question 1

To what extent do agricultural educators promote increased food production to achieve sustainable development goals on poverty and hunger in Oshimili South LGA of Delta State?

Table 1

Mean and Standard Deviation of Respondents on the Extent to Which Agricultural Educators Promote Increased Food Production to Achieve Sustainable Development Goals on Poverty and Hunger (n = 138)

S/N	Statements	$\bar{x}$	SD	Remark
1	Agricultural science educators have promoted higher food productivity among small scale farmers essential for national	2.1	0.83	Low Extent
2	Agricultural science educators have made isolated peasant farmers to engage in large scale farming which has increased food production in Oshimili South Local Government Area	1.8	0.76	Low Extent
3	Agricultural educators have improved food production through proffered management practices	2.1	0.98	Low Extent
4	Agricultura educators have increased farmers productivity and income through their trainings	2.2	0.97	Low Extent
5	Agricultural science teachers encourage their students to practice farming after graduation	2.0	0.90	Low Extent
	Cluster Mean	**2.04**	**0.89**	

Table 1 shows that items 1, 2, 3, 4 and 5 with mean scores of 2.1, 1.8, 2.1, 2.2 and 2.0 which are below the acceptable mean score. This indicate that the respondents disagreed that Agricultural science educators promote higher food productivity among small scale farmers essential for national food security, made isolated peasant farmers to engage in large scale farming which has increased food production, improved food production through proffering management practices has increased farmers productivity and income does not lead to the development of appropriate technology through efficient extension systems to a low extent. Hence, this shows that agricultural educators influence

on food production impact in decreasing food poverty in Oshimili South Local Government Area was on a low extent with a cluster mean score of 2.04.

Research Question 2

What are factors affecting agricultural educators' role in promoting increase in food production to achieve sustainable development goals on poverty and hunger in Oshimili South LGA of Delta State?

Table 2

Mean and Standard Deviation of Respondents on Factors Affecting Agricultural Educators' Role in Promoting Increase in Food Production to Achieve the Sustainable Development Goals on Poverty and Hunger (n = 138)

S/N	Statements	X	SD	Remark
11	Lack of appropriate technologies for processing, packaging, and storage	3.4	0.77	Agree
12	Low rate of technology adoption	3.0	0.65	Agree
13	Lack of information on marketing channels for farmers and processors	3.0	0.85	Agree
14	Poor linkages between research and the food industries	3.1	0.75	Agree
15	Lack of infrastructures	3.2	0.68	Agree
16	Land tenure system	3.2	0.73	Agree
17	Inability to access loan at affordable interest rate	3.1	0.83	Agree
	Cluster Mean	**3.14**	**0.75**	

Table 2 shows that items 11, 12, 13, 14, 15, 16 and 17 with mean scores of 3.4, 3.0, 3.0, 3.1 3.2, 3.2 and 3.1 which are above the acceptable mean score 2.50. This indicate that the respondents agreed that lack of appropriate technologies for processing, packaging, and storage, low rate of technology adoption, lack of information on marketing channels for farmers and processors, poor linkages between research and the food industries, lack of infrastructures, land tenure system and inability to access loan at affordable interest rate affect agricultural science educators in increasing food production to achieve sustainable development goals on poverty and hunger in Oshimili South Local Government with a mean score of 3.14.

Discussion of Findings

The findings in Table 1 revealed that the respondents disagreed that Agricultural science educators promote higher food productivity among small scale farmers essential for national food security, made isolated peasant farmers to engage in large scale farming which has increased food production, improved food production through proffered management practices has increased farmers productivity and income does not lead to the development of appropriate technology through efficient extension systems to a low extent. Hence, this shows that agricultural educators do not promote food production impact in decreasing food poverty. The finding is contrary to the suggestion of Tirado, (2018) who opined that promoting productivity among small-scale farmers is essential for national growth and food security in Nigeria. Peasant farmers should be encouraged to engage in Integrated Farming Systems (IFS) based on integration of livestock production into cropping systems. Through proper management practices, IFS increase soil fertility; minimizes insect and disease problems, energy requirements, and risks due to climatic fluctuation; and protects the environment through erosion control. Similarly, increasing farmers' productivity and income will require the development of appropriate technology through research and the transfer of research output through

efficient extension systems (Abalu, *et al.*, 2015).

The findings in Table 2 revealed that the respondents agreed that lack of appropriate technologies for processing, packaging, and storage, low rate of technology adoption, lack of information on marketing channels for farmers and processors, poor linkages between research and the food industries, lack of infrastructures, land tenure system and inability to access loan at affordable interest rate affects agricultural science educators in increasing food production to achieve sustainable development goals on poverty and hunger in Oshimili South Local Government. This finding is in agreement with Okuneye (2011) who observed that rural poverty and hunger are on the increase due to lack of appropriate technologies for processing, packaging and storage of agricultural products and poor infrastructures in the farming communities.

Conclusion

Based on the results of this study, it is clear that the role of Agricultural educators in promoting food production to achieve sustainable development goals on poverty and hunger in Oshimili South Local Government Area has low impact on food production which has contributed vastly to food poverty and hunger in the area of study. The study also revealed that Agricultural Science educators inability to increase food production to achieve sustainable development goals on poverty and hunger were affected by lack of appropriate technologies for processing, packaging, and storage, low rate of technology adoption, lack of information on marketing channels for farmers and processors, poor linkages between research and the food industries, lack of infrastructures, land tenure system and inability to access loan at affordable interest rate. Hence, to eradicate the affecting factors strategies are to be employed to reduce the food hunger and poverty.

Recommendations

Based on the findings in this study and the discussions the following recommendations were made:

1. Agricultural educators should be encouraged to engage in practical agriculture in the communities where they teach by providing free land for them, this will enable them to proffering solution to crop failure because they are practically involved in farming.
2. Research grants should be made available to agricultural educators by governments and non- governmental organizations to improve research among them.
3. Provision of infrastructure in the farming communities will help to promote the interest of agricultural educators to leave in the farming communities thereby promoting food production among farmers.

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SKILLS REQUIRED BY SECONDARY SCHOOL LEAVERS IN GUINEA FOWL (*Numida meleagris*) PRODUCTION FOR SUSTAINABLE LIVELIHOOD IN BENUE STATE, NIGERIA

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Abstract
This study identified skills required by secondary school leavers in guinea fowl production for sustainable livelihood in Benue State. The specific objectives of the study were to identify skills required in: planning, housing and feeding for sustainable livelihood gains from guinea fowl production. Four research questions were raised and four hypotheses formulated to guide the study. The design of the study was survey design. The population of the study was 71 comprising 20 Agricultural Extension agents in the three Agricultural Zones and 51 guinea fowl farmers of Graduates and Unemployed Youth Scheme (GUYS) Benue State. There was no sampling since the population was small and could be effectively handled. The instrument for the study was a structured questionnaire titled Skills Required for Guinea Fowl Production Questionnaire (SRGPQ). Face and content validation was done by three validators, reliability of 0.91 was obtained through Cronbach Alpha method. Data analysis was done using mean and standard deviation to answer the research questions, while t-test statistics was used to test the null hypotheses at 0.05 level of significance. The findings revealed that the identified skills in the area of planning, housing, feeding were skills required by Secondary School Leavers in Guinea fowl production for sustainable livelihood in Benue State. Based on the findings of the study, it was recommended among others that Skill Acquisition Centers in Benue State and animal husbandry teachers could use the identified skills to train Secondary School leavers as out of school retraining programme to enhance Guinea fowl production for sustainable livelihood in Benue State.

Keywords: Skill, Secondary School Leavers, Sustainable Livelihood, Benue State, Nigeria

Introduction

Guinea fowl (*Numida meleagris*) is a monogastric (simple stomach) bird, primarily raised for their meat, eggs and secondarily for feather, manure and laboratory use. Guinea fowls are rough, vigorous, hardy and mostly disease free game bird which are usually ground dwellers that live in environments ranging from desert to tropical forest and wetland. Guinea fowl meat is high in protein, low in fat, calories, and cholesterol when compared to most of the meat eaten in the United States (Ikani & Dafwang, 2014). They are medium-sized, although larger than chicken, they have a round body and a small head, their head is featherless with a crest on the top and bright red "wattle" around their beak. They have dark grey or black plumage with obvious white spots. They are birds considered as farm animals of economic importance (Embury, 2015). There are three major species of guinea fowl; guinea pearl, lavender and Helmet. The Helmet guinea fowl has been introduced to many locations around the world, and all breeds of domestic guinea fowl originate from West Africa (Ogah, 2013).

In Nigeria, the rearing of guinea fowl as domestic animals is not too popular as it ought to be, this is because its potentialities as a rich source of protein have not been recognized by many. The history of its keeping in most states of the federation showed that its current activity is at a low level (Baruwa, 2014). The birds, apart from contributing to household income, play an important role in the sociocultural lives of the people (Teye & Adam, 2013). However, the bulk of guinea fowls produced are raised by subsistence farmers mainly from the rural

areas in northern Nigeria, the guinea fowl population has been estimated to constitute 7.1% of the total poultry population in Nigeria (FAO, 2014). Guinea fowl serves as a delicacy and meat of choice for many people with its meat proximate protein composition of 19.5% and higher than indigenous chicken in terms of taste and meat quality. In Nigeria, they are reared traditionally under the extensive system just like the local chicken; they are left to scavenge around farmsteads, open fields and compounds for scraps, worms, insects, seeds, leaves, fruits etc. As a result of this system of management, their productivity is low (Ayorinde, 2014). Effective large scale guinea fowl production requires resource management and skill training in guinea fowl production enterprise. Guinea fowl is traditionally a major ingredient in the diet of the people of Benue State and are consumed in large numbers. In recent times its population has declined considerably due to poor production skills. These have made it difficult for people to find guinea fowl as they used to, thus the demand for guinea fowl exceeds the supply in the state. However, for successful production of guinea fowl, certain skills are required such as planning, housing, feeding, and also to identify the sustainable livelihood indicators gains in guinea fowl production.

There is need for Secondary school leavers to acquire these skills in Guinea fowl production to attain sustainable livelihood. Skills as a subject of "task" as explained by Nwokike (2011) is mostly acquired by Secondary School Leavers in entrepreneurial centers by Agricultural Extension Agents through a repetitive performance of an operation. Agricultural Extension Agents in the view of Egbule (2014) (in Amonjenu & Wombo (2016), are professionals who assist farmers through educational procedures in improving farming methods and techniques, increasing production efficiency and income, improving livelihood and lifting social and educational standards. They further explain that Agricultural Extension Agents provide assistance to the farmers to help them identify and analyze their production problems and become aware of the opportunities in agriculture for improvement. Extension agents persuade the farmers to appreciate the value of change in the need to adopt new agricultural methods (Ekele, 2015). It is hoped that adoption of new agricultural production methods could enhance the livelihood of farmers if they are properly assisted by extension agents.

Livelihood is a set of activities, involving securing water, food, medicine, shelter, clothing and the capacity to acquire the above necessities of life involves working either individually or as a group by using endowments (both human and material) for meeting these requirements of oneself and his/her household on a sustainable basis with dignity (Hema, 2014). In this context, sustainable livelihood refers to the capabilities and assets required in guinea fowl production which one dwells on, in order to earn a living without compromising the future. Sustainable livelihood can be attained through guinea fowl production if one acquires the skills and applies it in guinea fowl production.

Secondary school leavers as used in the study refers to those individuals having completed six years of secondary education could not secure admission into any tertiary institution or get employed in any job. In Benue State, most Secondary School Leavers depend on their parents for survival while a few migrate to urban cities in search of white-collar jobs which are not easily accessible. The researcher observed with keen interest that most Secondary School Leavers in Benue State, upon graduation from secondary schools are not capable of growing guinea fowl farm, hence the need to identify skills in guinea fowl production which could be used in the training of Secondary School Leavers to engage in guinea fowl production enterprise for sustainable livelihood.

Secondary School Leavers unemployment is on the increase in Benue State, thousands of unskilled Secondary School Leavers are produced every year from the state school system (Akor, 2014).

Employers of labour are handicapped in providing employment to the Secondary School Leavers due to lack of employable skills, out of frustration, they engage themselves in illegal jobs such as prostitution, thuggery, armed robbery, human trafficking, kidnapping, impersonation, cultism among others to earn a living. Meanwhile, Secondary School Leavers in Benue State can be gainfully engaged in the production of guinea fowl to reduce poverty, unemployment and other societal menace. It is the anticipation of parent and the society that Secondary School Leavers who offered animal husbandry upon graduation should be able to demonstrate practical skills in animal production. This anticipation stems out from the objective of animal husbandry in Senior Secondary Schools, which include: to stimulate and sustain student interest in practical skills; to enable students acquire useful knowledge and practical skills in animal husbandry; and also, to be able to rear at least two animals that are adaptable to their agricultural environment (Akor, 2014). From this requirement, guinea fowl which is a tropical and adaptable bird in the study area is important to students while in secondary school with all the necessary skills required for a successful enterprise or firm, also the skill acquisition center was expected to provide skills in different occupational areas. Experience, however, has shown that the training programme of the skill acquisition center is devoid of skills in some occupational areas such as guinea fowl production.

It is the researcher's view that if these skills in guinea fowl production are identified and taught to Secondary School Leavers by Agricultural Extension Agents, they would contribute positively towards increasing guinea fowl supply in the state. In addition, they would become self-reliant which would reduce unemployment and crime among the school leavers. Hence, the decision to undertake this study on skills required by Secondary School Leavers for guinea fowl production for sustainable livelihood in Benue State.

Purpose of the Study

The purpose of this study was to identify skills required by secondary school leavers in guinea fowl production for sustainable livelihood in Benue State. Specifically, the study seeks to identify:

i. skills in planning guinea fowl production;
ii. skills in housing of guinea fowl; and
iii. skills in feeding of guinea fowl

Research Questions

1. What are the skills required by Secondary School Leavers in planning for guinea fowl production?
2. What are the skills required by Secondary School Leavers in housing of guinea fowl?
3. What are the skills required by Secondary School Leavers in feeding guinea fowl?

Hypotheses

The following hypotheses are formulated and will be tested at 0.05 level of significance.

Ho1 There is no significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in planning of guinea fowl farming for sustainable livelihood.

Ho2 There is no significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in housing guinea fowl for sustainable livelihood.

Ho3 There is no significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in feeding guinea fowl for sustainable livelihood.

Methodology

The study adopted a survey research design, with a population of the 71 subjects which made up of 20 extension agents, and

51 guinea fowl farmers. The entire population was used for the study due to their manageable size. Three research questions were developed and answered by the study while three null hypotheses were formulated and tested. The study utilized a 34-item questionnaire in collecting data using a four points scale of Highly Required (HR) =4; Averagely Required (AR) =3; Slightly Required (SR) =2 and Not Required (NR) =1 for research question 1-3. The face and content validation of the instrument was carried out by three experts. Cronbach alpha technique was used to determine the internal consistency of the questionnaire items and a coefficient of 0.91 was obtained. The questionnaire was administered on 71 respondents; 69 copies were retrieved and used for analysis. The research questions were answered using weighted mean and standard deviation, while hypotheses were tested using t- test statistics. A cut-off of 2.50 was determined as the arithmetic mean with an interval scale of 0.05 to determine the upper limit on which decision on each item was based. The decision rule is that any item with mean of 2.50 and above was regarded as required and any item with mean less than 2.50 was regarded as not required. Any cluster or items with a p-value greater than or equal to the alpha value of 0.05 ($P \geq 0.05$) was regarded as not significant and not rejected while any cluster or item with a p-value less than the alpha value of 0.05 ($P < 0.05$) was regarded as significant and rejected.

Results

The results of the study were obtained from the research questions answered and the hypotheses tested. They are as presented in Table 1-4.

Research Question 1

What are the skills required by Secondary School Leavers in planning of guinea fowl farming for sustainable livelihood in Benue State?

To answer the above question, data on skills required by Secondary School Leavers in planning guinea fowl production were collected and subjected to analysis using mean and standard deviation as presented in Table 1.

Table 1

Mean Ratings of Respondents on Skills Required by Secondary School Leavers in Planning Guinea Fowl production (n=69)

S/N	Item Statement	$\bar{X}$	σ	Remarks
	Skills in Planning Guinea Fowl production			
1.	Survey market to determine the feasibility of starting guinea fowl enterprise.	3.51	.58	Required
2.	Formulate specific objectives for guinea fowl production enterprise.	3.32	.67	Required
3.	Decide on the farm size.	3.45	.69	Required
4.	Decide on the breed of guinea fowl to rear.	3.23	.64	Required
5.	Identify good source of breeder stock.	3.36	.64	Required
6.	Decide on the system of management to adopt.	3.20	.67	Required
7.	Identify the inputs required for guinea fowl production.	3.30	.69	Required
8.	Identify available market for guinea fowl production.	3.30	.60	Required
9.	Identify relevant farm records.	3.25	.65	Required
10.	Identify source of funding for guinea fowl production.	3.37	.66	Required
11.	Identify farm site with flat topography.	3.26	.72	Required
12.	Improve breeder stock where necessary.	3.41	.69	Required
	Grand Mean	**3.33**	**.66**	**Required**

N= number of respondents, $\bar{X}$= Mean of the respondents, σ = Standard deviation of the total sampled population

Table 1 reveals that all the 12 items had mean values that ranged from 3.20 to 3.51 with a cluster mean of 3.33 which were above the cut-off point of 2.50 on a four-point scale. This implies that all the 12 items are skills required by Secondary School Leavers in planning of guinea fowl production for sustainable livelihood in Benue state as established by extension agents and guinea fowl farmers. The standard deviation of all the 12 items ranged from 0.58 to 0.72 with a cluster standard deviation of 0.66, indicating that the respondents were not far from the mean and *each* other in their responses.

Hypothesis 1

There is no significant difference in the mean rating of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in planning of guinea fowl production for sustainable livelihood in Benue State.

To test the above hypothesis, the mean ratings of Agricultural Extension Agents and guinea fowl farmers were analyzed using t-test and presented in Table 2.

Table 2

t-test Analysis of the Mean Ratings of the Responses of respondent on Skills Required by Secondary School Leavers in Planning Guinea Fowl Production

Variable	N	Mean	Df	P-Value	Alpha-Value	Dec.
Agric. Ext. Agents	20	3.154	67	.001	0.05	S,R
Guinea Fowl Farmers	49	3.429				

N= Number of respondents, df = degree of freedom, Sig. = P-value; P < 0.05, S = significant, R = Rejected.

Table 2 presents t-test of the mean ratings of respondents on the skills required by Secondary School Leavers in planning of guinea fowl farming for sustainable livelihood in Benue state at $p<0.05$. The Table shows a p-value of 0.001 which is less than the alpha value 0.05 at 67 degrees of freedom. This implies that the test is significant hence there was statistical significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in planning of guinea fowl farming for sustainable livelihood in Benue State; therefore, the null hypothesis was rejected. This implies that the two groups of respondents significantly differ in their responses on the skills required by secondary school leavers in planning guinea fowl production.

Research Question 2

What are the skills required by Secondary School Leavers in housing of guinea fowl for sustainable livelihood in Benue State?

To answer the above question, data on skills required by Secondary School Leavers in housing of guinea fowl was collected and subjected to analysis using mean and standard deviation as presented in Table 3.

Table 3
Mean Ratings of Respondents on Skills Required by Secondary School Leavers in Housing Guinea Fowl (n=69)

S/N	Item Statement	$\overline{X}$	σ	Remarks
	Skills in Housing Guinea Fowl			
1.	Select site considering sources of water and nearness to markets	3.41	.693	Required
2.	Decide on the type of guinea fowl house to construct	3.33	.586	Required
3.	Mark the portion with pegs to lay the foundation considering sunrise and sunset.	3.45	.631	Required
4.	Erect the house not less than 12 meter high from the floor for proper ventilation.	3.32	.696	Required
5.	Cement floor with concrete about 2 inches thick	3.41	.671	Required
6.	Cover the floor with wood shavings or rice husk to provide warmth	3.35	.660	Required
7.	Construct large pens with wooden doors for easy entrance and evacuation of products.	3.32	.581	Required
8.	Construct separate cages and nest box for incubation and brooding	3.36	.641	Required
9.	Screen the open side of the pens with wire mesh	3.19	.550	Required
10.	Provide foot bath at the entrance of the guinea house to prevent contamination.	3.54	.632	Required
	Grand Mean	**3.36**	**0.63**	**Required**

N= number of respondents, $\bar{X}$= Mean of the respondents, σ = Standard deviation of the total sampled population

Table 3 reveals that all the 10 items had mean values that ranged from 3.19 to 3.54 with a cluster mean of 3.36 which were above the cut-off point of mean 2.50 on a four-point scale. This implies that all the 10 items are skills required by Secondary School Leavers in housing of guinea fowl for sustainable livelihood in Benue state. The standard deviation of all the 10 items ranged from 0.55 to 0.69 with a cluster standard deviation of 0.63, indicating that the respondents were not far from the mean and each other in their responses

Hypothesis 2
There is no significant difference in the mean rating of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in housing of guinea fowl for sustainable livelihood in Benue State.

To test the above hypothesis, the mean ratings of Agricultural Extension Agents and guinea fowl farmers were analyzed using t-test and presented in Table 4.

Table 4
t-test Analysis of the Mean Ratings of the Respondents on Skills Required by Secondary School Leavers in Planning Guinea Fowl Production

Variable	N	Mean	Df	P-Value	Alpha-Value	Dec.
Agric. Ext. Agents	20	3.215	67	.014	0.05	S,R
Guinea Fowl Farmers	49	3.412				

N= Number of respondents, df = degree of freedom, Sig. = P-value; P < 0.05, S = significant, R = Rejected.

Table 4 presents t-test of the mean ratings of respondents on the skills required by Secondary School Leavers in housing of guinea fowl for sustainable livelihood in Benue state at p <0.05. The Table shows a p-value of 0.014 which is less than the alpha

value 0.05 at 67 degrees of freedom. This implies that the test is significant hence there is statistical significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in housing of guinea fowl for sustainable livelihood in Benue state; therefore, the null hypothesis was rejected. This implies that the two groups of respondents significantly differ in their responses on the skills required by secondary school leavers in housing guinea fowl production.

Research Question 3

What are the skills required by Secondary School Leavers in feeding of guinea fowl for sustainable livelihood in Benue state?

To answer the above question, data on skills required by Secondary School Leavers in feeding of guinea fowl was collected and subjected to analysis using mean and standard deviation as presented in Table 5.

Table 5

Mean Ratings of Responses of Respondents on Skills Required by Secondary School Leavers in Feeding Guinea Fowl (n=69)

S/N	Item Statement	$\overline{X}$	σ	Remarks
	Skills in Feeding Guinea Fowl			
1.	Identify the age of the guinea fowl to arrange for relevant feeding.	3.29	.597	Required
2.	Feed keets of (0-4 weeks) with chick mash.	3.41	.671	Required
3.	Provide keets of (5-8 weeks) with a starter ration of 240g CP/kg DM.	3.39	.599	Required
4.	Provide keets of (10-15 weeks) with a grower ration of 200g CP/kg DM.	3.25	.651	Required
5.	Provide guinea fowl of (19-24 weeks) with finisher ration of 160 g CP/kg DM.	3.43	.606	Required
6.	Provide pullet of 8-12 weeks with grower's mash.	3.16	.720	Required
7.	Provide layers (9-11 weeks) with layer mash twice in a day.	3.49	.586	Required
8.	Feed guinea cock with 3.5g of maintenance ration each day.	3.28	.662	Required
9.	Feed guinea hen with 4.6g of maintenance ration each day until hatching.	3.32	.556	Required
10.	Provide layers of (29-40 week) with diet containing ME value of 2750 kcal/kg.	3.30	.649	Required
11.	Provide water at libidum.	3.45	.607	Required
12.	Provide culled guinea fowl with 165 g/CP/kg DM in their diet.	3.20	.655	Required
	Grand Mean	**3.33**	**.63**	**Required**

N= number of respondents, $\bar{X}$= Mean of the respondents, σ = Standard deviation of the total sampled population

Table 5 reveals that all the 12 items had mean values that ranged from 3.16 to 3.49 with a cluster mean of 3.33 which were above the cut-off point of mean 2.50 on a four-point scale. This implies that all the 12 items are skills required by Secondary School Leavers in feeding of guinea fowl for sustainable livelihood in Benue State. The standard deviation of all the 12 items ranged from 0.56 to 0.72 with a cluster standard deviation of 0.63, indicating that the respondents were not far from the mean and each other in their responses.

Hypothesis 4

There is no significant difference in the mean rating of Agricultural Extension Agents and guinea fowl farmers on the skills required by

Secondary School Leavers in feeding of guinea fowl for sustainable livelihood in Benue State.

To test the above hypothesis, the mean ratings of Agricultural Extension Agents and guinea fowl farmers were analyzed using t-test and presented in Table 6.

Table 6

t-test Analysis of the Mean Ratings of the Respondents on Skills Required by Secondary School Leavers for Feeding Guinea Fowl

Variable	N	Mean	df	P-Value	Alpha-Value	Dec.
Agric. Ext. Agents	20	3.250	67	.221	0.05	NS, NR
Guinea Fowl Farmers	49	3.363				

N= Number of respondents, df = degree of freedom, Sig. = P-value; P > 0.05, NS = Not significant, NR = Not rejected.

Table 6 presents t-test of the mean ratings of respondents on the skills required by Secondary School Leavers in feeding of guinea fowl for sustainable livelihood in Benue State at p >0.05. The Table shows a p-value of 0.221 which is greater than the alpha value 0.05 at 67 degrees of freedom. This implies that the test is not significant hence there is no statistical significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in feeding of guinea fowl for sustainable livelihood in Benue state; therefore, the hypothesis was not rejected. This implies that the two groups of respondents significantly differ in their responses on the skills required by secondary school leavers in feeding guinea fowl production.

Discussion of Findings

Results from Table 1 revealed that Secondary School Leavers required 12 skills in planning of guinea fowl farming for sustainable livelihood in Benue State. The skills were: survey market to determine the feasibility of starting guinea fowl enterprise, formulate specific objectives for guinea fowl production enterprise, decide on the farm size, decide on the breed of guinea fowl to rear, identify good source of breeder stock, decide on the system of management to adopt, identify the inputs required for guinea fowl production, identify available market for guinea fowl Production, identify relevant farm records, identify source of funding for guinea fowl production, identify farm site with flat topography, improve breeder stock where necessary. The result from the corresponding hypothesis on Table 2 however showed that there was significant difference in the mean ratings of responses of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in planning of guinea fowl farming for sustainable livelihood in Benue State. The significant difference in the mean ratings is as a result of the fact that the Guinea fowl farmer rated the skills items higher than their counterpart (Agricultural Extension Agents). The finding of the study on the skills required by Secondary School Leavers in planning for guinea fowl farming is in agreement with the findings of Nwachukwu (2019) who identified 12 skills planning of turkey production, some of the skills according to the author were: draw a time table of activities in turkey farming enterprise; decide on location for sitting the farm; identify relevant farm input required for the production; budget for the guinea fowl farm enterprise; identify sources of fund for establishment of guinea fowl farm, among others. Also, the study is in conformity with the findings of Ugwuoke and Osinem (2014) who identified the following skills in planning operations as: setting organizational objectives, identification of opportunities, selection of course of action, formulating specific targets and feedback in guinea fowl enterprise, among others.

Findings from Table 3 revealed that Secondary School Leavers required 10 skills in housing of guinea fowl farming for sustainable livelihood in Benue state. The skills were: select site considering sources of water and nearness to markets, decide on the type of guinea fowl house to construct, mark the portion with pegs to lay the foundation considering sunrise and sunset, erect the house not less than 12 meter high from the floor for proper ventilation, cement floor with concrete about 2 inches thick, cover the floor with wood shavings or rice husk to provide warmth, construct large pens with wooden doors for easy entrance and evacuation of products, construct separate cages and nest box for incubation and brooding screen the open side of the pens with wire mesh, provide foot bath at the entrance of the guinea house to prevent contamination. The result from the corresponding hypothesis on Table 4 however showed that there was significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in housing of guinea fowl for sustainable livelihood in Benue State. The significant difference in the mean ratings is as a result of the fact that the guinea fowl farmers rated the skills higher than their counterpart (Agricultural Extension Agents) which implies that the two groups of respondents significantly differ in their responses on the skills required by secondary school leavers in planning guinea fowl production. The finding of the study on the skills required by Secondary School Leavers in housing of guinea fowl is in agreement with the findings of Yakubu, *et al.* (2014) who found that guinea fowl should be provided with cages, dip litters and battery cages for proper security and ventilation.

Findings from Table 5 revealed that Secondary School Leavers required 12 skills in feeding of guinea fowl for sustainable livelihood in Benue State. The skills were: identify the age of the guinea fowl to arrange for relevant feeding, feed keets of (0-4 weeks) with chick mash, provide keets of (5-8 weeks) with a starter ration of 240 g CP/kg DM, provide keets of (10-15 weeks) with a grower ration of 200 g CP/kg DM, provide guinea fowl of (19-24 weeks) with finisher ration of 160 g CP/kg DM, provide pullet of 8-12 weeks with grower's mash, provide layers (9-11 weeks) with layer mash twice in a day, feed guinea cock with 3.5g of maintenance ration each day, feed guinea hen with 4.6g of maintenance ration each day until hatching, provide layers of (29-40 week) with diet containing ME value of 2750 kcal/kg , provide water at libidum, provide culled guinea fowl with 165 g/CP/kg DM in their diet. The result from the corresponding hypothesis on Table 6 however showed that there was no statistical significant difference in the mean ratings of Agricultural Extension Agents and guinea fowl farmers on the skills required by Secondary School Leavers in feeding of guinea fowl for sustainable livelihood in Benue State. The finding of the study on the skills required by Secondary School Leavers in feeding of guinea fowl is in conformity with the findings of Kusina, *et al.* (2012) who found that the following feeding skills in guinea fowl, they were: provide water at libitum, feed keet with starter mash until 6 weeks, provide culled bird with protein ration.

Conclusion

Guinea fowl production offers a promising avenue for secondary school leavers to develop valuable skills and contribute to sustainable agriculture. The skills required for successful Guinea fowl production include: planning, housing, feeding, breeding health management and marketing. These skills will enable them establish and manage guinea fowl enterprise which will promote food security and employment in the state.

Recommendations

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

1. The identified skills on Guinea fowl production should be incorporated into the programme of the skill acquisition

centers in the state so that it could be used for training and retraining of Secondary School Leavers for sustainable livelihood and self-employment.

2. The identified skills in the study should be integrated into the senior secondary school curriculum to enable secondary school students acquire the skills before graduation.
3. The findings of the study should be made available to government policy makers through the state Agricultural Extension Agents services and media to make policies that would encourage Guinea fowl production.

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RELATIONSHIP BETWEEN AGRICULTURAL SCIENCE TEACHERS' COMPETENCY AND EFFECTIVE INSTRUCTIONAL DELIVERY OF AGRICULTURAL SCIENCE IN SENIOR SECONDARY SCHOOLS IN DELTA STATE

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Abstract
This study examined the relationship between agricultural science teachers' competency and effective instructional delivery of agricultural science in senior secondary schools in Delta State. The study was guided by three research questions and three null hypotheses. The descriptive survey design was adopted for the study. A sample of 110 Agricultural Science teachers from secondary schools in Delta State was used as respondents from a population of 218 teachers. A self-constructed questionnaire consisting of five sub-scales and validated by subject experts and measurement and evaluation experts was used for the study. The reliability of the instrument was established using Cronbach Alpha test of reliability which yielded coefficient of 0.85. The Pearson Product Moment Correlation Coefficient and Coefficient of Determination were used in answering the research questions while F-test and ANOVA associated with Linear Regression were used in testing the stated hypotheses. Findings from the study indicated that there was significant relationship between professional competency, instructional strategy competency, classroom management competency, and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. It was concluded that effective instructional delivery of Agricultural Science was dependent on teachers' professional, instructional strategy, and classroom management competencies. It was recommended that in order to ensure effective instructional delivery of Agricultural Science, there is need for the development of several teacher competencies by the federal and state ministries of education through conferences/workshops among Agricultural Science teachers.

Keywords: Classroom management competency, Instructional Delivery, Instructional strategy competency, Professional competency, Teachers' competency

Introduction

Competencies are the skills and knowledge that enable a teacher to be successful. Teacher competency is the ability of the teacher to display, perform, or carryout certain acts assigned to him/her effectively. It is the performance expression of what the teacher is capable of doing. Comfort and Bonaventure in Kaizer (2021) referred to competency as the ability required by individuals to function effectively in an organization. Competency is seen as skills, knowledge, attitudes and abilities that distinguish high performance (Nnodim & Johnwest, 2016). That is to say competency refers to skills or knowledge that leads to superior performance. Competencies are formed through an individual/organization's knowledge, skills and abilities and provide a framework for distinguishing between poor performances through to exceptional performance (Nnodim & Johnwest, 2016). Ovbiagele, *et al.* (2019) defined competency as being well qualified and having adequate ability to perform a specific role. This means that there are several competencies required of Agricultural Science teachers for effective instructional delivery to ensure food security within the country.

The Agricultural Science teacher is therefore tasked with the key responsibility of ensuring that every skill necessary for effective instructional delivery is acquired. Putting together in a single piece the complex role of the teacher in the process of instructional delivery is often a very daunting

task. Yet, it is very pertinent to articulate the relationship between teacher competencies and the teachers' instructional delivery. Instructional delivery is the procedure through which the teacher carefully selects the teaching methods and the technique for handling down the learning experiences to students through the appropriate medium of instruction (Renner, *et al.*, 2022). It was observed in Agina-Obu and Onwugbuta-Enyi (2017) that instructional delivery is an activity that involves a person, who utilizes past experiences, combines the material, methods, ideas, and media in an existing and new means to assist students. In ensuring this, the teacher must be adequately equipped to perform the complex task of meeting students' needs and expectations.

Teachers' professional competencies are very important factors that determine teachers' task performances in education industry for productivity. The development of teachers' professional competences is geared towards the improvement of knowledge and skills of the teaching staff in support of current role, which prepare them for future role (Madumere-Obike & Nwabueze, 2012). For example, Abubakar (2016) observed that there are particular skills in Agriculture which are vital in teaching the course as a profession and which lead Agricultural Science teachers to be considered professionals. It is this professional knowledge that will be applied during students' training which resulted in their basic professional competency. Gentuck (2012) disclosed that teachers' professional competencies predict the quality of lesson design, students assessment, students results, data organization and overall classroom climate. Ambe and Agbor (2014) revealed that teachers' professional competence had a significant relationship with effective curriculum implementation in Cross River State.

Kang'ahi, *et al.* (2012) found a positive relationship between instructional strategy competency and effective instructional delivery evidenced through learners' academic performance. Furthermore, Muraya and Kimano (2011) found that cooperative learning (learner centred) approach resulted in significantly effective instructional delivery leading to higher mean performance scores compared to teachers' incompetent use of instructional strategy. The study concluded that learner-centred method was an effective teaching approach, which when adopted by teachers positively influenced instructional delivery. Nwigwe and Ugwu (2017) conducted a study which examined the teachers' instructional competence and implementation of Economics curriculum found that teacher competencies in instructional strategy, content matter, methodology and instructional materials have great influence on instructional delivery and to a large extent on the implementation of economics curriculum.

A good classroom management is a means to quality/effective instructional delivery because a good classroom management creates a good learning atmosphere (Austin & Omomia, 2014). Students who participate in an effective learning atmosphere having the chance to present their own abilities in the classroom become happy and more motivated and have positive attitudes towards the school, the subject being taught (Eranıl, *et al*., 2019) and they get more successful. In contrast to this, a weak classroom management competence prevents the target educational outcomes (Eranıl, *et al.*, 2019). In the classroom with a weak classroom management, some undesirable behaviors such as talking idly, chatting with a friend, throwing the objects, walking idly in the classroom, cheating, telling lies and aggression/violence are observed to come out (Pagliaro, 2011).

Kurt, *et al.* (2014) found in their study that classroom management competency had a high and moderate level effect on teachers' self-confidence and effective instructional delivery. According to Abu-Tineh, *et al.* (2011), there is a high level and significant relationship between teacher self-confidence, classroom management styles and effective instructional delivery. Eranıl, *et al.* (2019) in

the examination of classroom management competencies of faculty of education students revealed that pre-service teachers had high classroom management competency, self-confidence in teaching and effective teaching practice.

Student's learning outcome is often claimed to be a function of teacher competency in the instructional delivery process. In other words, effective instructional delivery is determined by how competent or incompetent the teacher is. It is a known fact that teachers affect the academic performance of students positively or negatively through classroom instructional delivery. For students to achieve their academic goals and get good results, they need to be taught by teachers, who are competent in all ramifications, whose ability to employ effective teaching-learning processes and instructional methodologies as well as the mastery of knowledge in their fields are needed. In consideration of the professional, instructional strategy, and classroom management competencies of the teacher as mentioned above, the researcher is interested in discovering whether or not the aforementioned competencies impact on teachers' instructional delivery. How true this claim is, and to what extent teacher competencies influences the training of students is the focus of this study:

Research Questions

1. What is the relationship between teachers' professional competency and effective instructional delivery of Agricultural Science in senior secondary schools?
2. What is the relationship between teachers' instructional strategy competency and effective instructional delivery of Agricultural Science in senior secondary schools?
3. What is the relationship between teachers' classroom management competency and effective instructional delivery of Agricultural Science in senior secondary schools?

Hypotheses

1. There is no significant relationship between teachers' professional competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.
2. There is no significant relationship between teachers' instructional strategy competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.
3. There is no significant relationship between teachers' classroom management competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

Methodology

The study adopted a descriptive survey design. The target population of the study was made up of all agricultural science teachers in Delta State secondary schools. Purposive sampling procedure was used to draw up a sample size of 110 from a population of 218 Agricultural Science teachers. The questionnaire consisted of 40 items in a close-ended form of a four-point scale made up of five sub-scales namely: professional competency scale; instructional strategy competency scale; classroom management competency scale; and Instructional Delivery Scale. The reliability of the instrument was established using Cronbach Alpha test of reliability which yielded coefficient of 0.85. The Pearson Product Moment Correlation Coefficient and Coefficient of Determination were used in answering the research questions. Linear and Multiple Regression was used in testing the stated hypotheses at an alpha level of 0.05 level of significance.

Results

The results are as presented in Tables 1 – 6.

Research Question 1

What is the relationship between teachers' professional competency and effective

instructional delivery of Agricultural Science in senior secondary schools in Delta State?

Table 1

Pearson Correlation Coefficient and Coefficient of Determination of Teachers' Professional Competency and Effective Instructional Delivery of Agricultural Science

Variable	N	r	r^2	r^2%	Decision
Professional Competency	110	.777	.604	60.4	Positive Relationship
Instructional Delivery					

*Significance: $P \leq 0.05$

The result in Table 1 shows the Pearson product moment correlation coefficient (r) value of 0.777 as the relationship between Agricultural Science teachers' professional competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. The coefficient of determination (r^2) value of 0.604 and the amount of contribution of teachers' professional competency to effective Agricultural Science instructional delivery was 60.4%. This shows a positive relationship between Agricultural Science teachers' professional competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

Research Question 2

What is the relationship between teachers' instructional strategy competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State?

Table 2

Pearson Product Moment Correlation and Coefficient of Determination of Teachers' Instructional Strategy Competency and Effective Instructional Delivery of Agricultural Science in Senior Secondary Schools in Delta State

Variable	N	R	r^2	r^2%	Decision
Instructional Strategy Competency	110	.231	.053	5.3	Positive Relationship
Instructional Delivery					

*Significance: $P \leq 0.05$

The result in Table 2 indicates the r-value of 0.231 as the relationship between Agricultural Science teachers' instructional strategy competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. The coefficient of determination (r^2) value of 0.053 and the amount of contribution of instructional strategy competency to instructional delivery was 5.3%. This shows a positive relationship between instructional strategy competency and instructional delivery among secondary school teachers in Delta State.

Research Question 3

What is the relationship between teachers' classroom management competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State?

Table 3

Pearson Correlation Coefficient and Determination of Teachers' Classroom Management Competency and Effective Instructional Delivery of Agricultural Science in Delta State

Variable	N	r	r^2	r^2%	Decision
Classroom Management Competency					Positive
	110	.114	.013	1.3	Relationship
Instructional Delivery					

*Significance: $P \leq 0.05$

Table 3 shows the r-value of 0.114 which signify the relationship between teachers' classroom management competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. The coefficient of determination (r^2) was 0.013 and the amount of contribution of teachers' classroom management competency to instructional delivery was 1.3%. Therefore, this revealed a positive relationship between the two variables.

Hypothesis 1

There is no significant relationship between teachers' professional competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

Table 4

Regression Analysis on Teachers' Professional Competency and Effective Instructional Delivery of Agricultural Science in Senior Secondary Schools in Delta State

ANOVA

Model 1	SS	Df	MS	F	P
Regression	25630.802	1	25630.802	1216.039	.000[b]
Residual	16819.678	798	21.077		
Total	42450.480	799			
	Unstandardized Coefficient		**standardized Coefficient**		
Model	**B**	**Std. Error**	**Beta**	**t-Ratio**	**P**
(Constant)	20.005	.497		40.264	.000
Professional Competency	11.421	.328	.777	34.872	.000

Dependent variable: Instructional Delivery

Table 4 shows the F-calculated value of 1216.039 and a p-value of 0.000. Testing the hypothesis at an alpha level of 0.05, the p-value of 0.000 was less than the alpha level of 0.05. Hence, the null hypothesis of "no significant relationship existed between Agricultural Science teachers' professional competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State" was rejected. The unstandardized coefficient (B-value) of 11.421 shows that teachers' professional competency was a good predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. The standardized coefficient value [$\beta = 0.777$; $P < 0.05$] indicates that instructional strategy competency was a significant predictor of instructional delivery of Agricultural Science. Therefore, teachers' professional competency was significant at predicting effective instructional delivery of Agricultural Science at P-value of 0.05.

Hypothesis 2

There is no significant relationship between teachers' instructional strategy competency

and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

Table 5

Regression Analysis on Teachers' Instructional Strategy Competency and Effective Instructional Delivery of Agricultural Science in Senior Secondary Schools in Delta State

	R	**R^2**	**Adjusted R^2**	**SEE**	
		ANOVA			
Model 1	**SS**	**Df**	**MS**	**F**	**P**
Regression	2259.807	1	2259.807	44.869	.000[b]
Residual	40190.673	798	50.364		
Total	42450.480	799			
	Unstandardized Coefficient		**standardized Coefficient**		
Model	**B**	**Std. Error**	**Beta**	**t-Ratio**	**P**
(Constant)	49.512	1.976		25.051	.000
Instructional Strategy Competency	.316	.047	.231	6.698	.000

Dependent variable: Instructional Delivery

Table 5 shows the f-value of 44.869 and p-value of 0.000. Testing the null hypothesis at an alpha level of 0.05, the p-value of 0.000 was less than the alpha level of 0.05. The null hypothesis is therefore rejected and the alternative holds true. Therefore, a significant relationship existed between Agricultural Science teachers' instructional strategy competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

The unstandardized coefficient (B-value) of 0.316 ($P< 0.05$) indicates that teachers' instructional strategy competency was a significant positive predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. The B value of 0.316 shows that for every one-unit change in teachers' instructional strategy competency, there will be a corresponding 0.316-unit change in effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. The standardized coefficient value [$\beta = 0.231$; $P< 0.05$] indicates that teachers' instructional strategy competency was a significant predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. Therefore, teachers' instructional strategy competency was a significant predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State at a P-value of 0.05.

Hypothesis 3

There is no significant relationship between teachers' classroom management competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

Table 6

Regression Analysis on Teachers' Classroom Management Competency and Effective Instructional Delivery of Agricultural Science in Senior Secondary Schools in Delta State

	R	**R^2**	**Adjusted R^2**	**SEE**	
	.114[a]	.013	.012	7.246	
		ANOVA			
Model 1	**SS**	**Df**	**MS**	**F**	**P**
Regression	555.782	1	555.782	10.586	.001[b]
Residual	41894.698	798	52.500		
Total	42450.480	799			
	Unstandardized Coefficient		**Standardized Coefficient**		
Model	**B**	**Std. Error**	**Beta**	**t-Ratio**	**P**
(Constant)	45.969	2.958		15.539	.000
Classroom Mgt Competency	.147	.045	.114	3.254	.001

Dependent variable: Instructional Delivery

Table 6 shows the f-value of 10.586 and p-value of 0.001. Testing the null hypothesis at an alpha level of 0.05, the p-value of 0.001 was less than the alpha level of 0.05. Hence, the null hypothesis which states that "there is no significant relationship between teachers' classroom management competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State" was rejected.

The unstandardized coefficient (B-value) of .147 shows that teachers' classroom management competency was a good predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. The standardized coefficient value [$\beta = 0.114$; $P < 0.05$] indicates that teachers' classroom management competency was a significant predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. Therefore, teachers' classroom management competency was significant at predicting effective instructional delivery at p-value of 0.05.

Discussion of Findings

The first finding of the study revealed that significant relationship existed between Agricultural Science teachers' professional competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. This finding indicated that teachers' professional competency was a good predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. This finding corroborates the findings of Gentuck (2012) who disclosed that teachers professional competencies predict the quality of lesson design, students' assessment, students result, data organization and overall classroom climate. Ambe and Agbor (2014) supported the above when they revealed that teachers' professional competence had a significant relationship with effective curriculum implementation in Cross River State. The direction of this finding is due to the fact that the successful implementation of any given curriculum depends largely on teachers' level of requisite skills.

The second finding revealed that significant relationship existed between Agricultural Science teachers' instructional strategy competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. This finding is in line with Kang'ahi, *et al.* (2012); Muraya and Kimano (2011) and Nwigwe and Ugwu (2017). For instance, Kang'ahi, *et al.* (2012) found positive relationship between instructional strategy competency and effective instructional delivery evidenced through learners' academic performance. Furthermore, Muraya and Kimano (2011) revealed that cooperative learning (learner centred) approach resulted in significantly effective instructional delivery. The study concluded that learner-

centred method was an effective instructional strategy approach, which when adopted by teachers positively influence instructional delivery. Nwigwe and Ugwu (2017) proved in their study that teacher competencies in instructional strategy, content matter, methodology and instructional materials have great influence on instructional delivery and to a large extent on the implementation of economics curriculum. Thus, from the above it was seen that teachers' instructional strategy competency was a significant positive predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

Finally, the third finding revealed that there was significant relationship between Agricultural Science teachers' classroom management competency and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. This finding is in line with Kurt, *et al.* (2014); and Abu-Tineh, *et al.* (2011). Lending credence to the above finding, Kurt et al. (2014) revealed that classroom management competency had a high and moderate level effect on teachers' self-confidence and effective instructional delivery. On the part of Abu-Tineh, *et al.* (2011), there was a high level and significant relationship between teacher self-confidence, classroom management styles and effective instructional delivery. The above is an indication that teachers' classroom management competency is a good predictor of effective instructional delivery of Agricultural Science in senior secondary schools in Delta State.

Conclusion

Based on the findings of the study, it was concluded that significant relationship existed between professional competency, instructional strategy competency, classroom management competency, and effective instructional delivery of Agricultural Science in senior secondary schools in Delta State. It was concluded that effective instructional delivery of Agricultural Science was dependent on teachers professional, instructional strategy, and classroom management competencies.

Recommendations

i. It is recommended that in order for effective training of students to ensure effective instructional delivery food security, there is need for the development of several teacher competencies by the Federal and State Ministries of Education through conferences/workshops.
ii. It is recommended that teachers should be skillful/competent in various instructional strategies that will improve classroom instructions. They should vary instructional strategies based on their skill levels and students' learning abilities.
iii. It is highly recommended that teachers should possess effective classroom management competency which will facilitate effective training of students in ensuring effective instructional delivery and a conducive atmosphere in the classroom.

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ASSESSMENT OF THE KNOWLEDGE AND LEVEL OF UTILIZATION OF TRADITIONAL METHODS OF FISH PROCESSING IN SOUTHWEST NIGERIA

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Abstract

Based on production level and processing intensity, A multi stage sampling technique was used to select three states out of the SouthWest States in Nigeria. Purposive sampling technique was used to select 10% of the registered fish processors with ADP in Lagos. Ogun and Ondo states respectively, making total number of 300 fish processors respondents for the study. Data were collected from primary sources which included structured interview schedule and personal observations. And Pearsons Product Moment Correlation were utilized to test the hypotheses at 0.05 level of significance Traditional fish processors mainly processed Orochromies_niloticus, Citharinus_citharus Clarias gariepinus and Synodontis membranacus. 82.0% of traditional fish processors had their knowledge of smoking method, 79.0% had the knowledge of sun drying, 60.3%, 45.3%, and 14.7% respectively had the knowledge of frying, salting and burning methods. In utilization of traditional methods of fish processing, sex, age, as formal education status were significant determinants. Net profits at peak season were ₦ 1,278,980.38 and ₦ 1,924,732.51 and net profit at lean season were ₦824,558.91 and ₦ 222,417.87. Long processing time [70.0], poor case of operation (56.0%) and poor-quality products (47.7%), were major constraints faced by fish processors. The conclusion is that income generating activity was a peculiar factor influencing traditional knowledge of methods in inland states, while traditional processing, education and household size were peculiar factors in coastlines states Government and Non-Governmental organizations should encourage develop and improve equipment that will enhance traditional fish processing methods used by fish processors.

Keywords: Assessment, Coastline, Processing, Traditional

Introduction

Fish processing is the process associated with fish and fish products between the time in which fish are caught or harvested and the time in which the final product is delivered to the customers. The processing and preservation of fish were 0f utmost importance since fish is highly susceptible to deterioration immediately after harvest and to prevent economic Losses (Okonta & Ekalemu, 2017). If fish is not sold fresh, preservation methods should be applied to extend its shelf-Life. These include smoking, drying, burning, salting, and frying. Efficient preparation of fish is important when top quality, maximum yield and highest possible profits are to be achieved (Davies, 2018). There is increasing evidence that for development to become sustainable, the socio-economic, cultural and environmental life of the people must be given a special consideration when placed side by side with natural and physical resources. Millar (2015) affirmed that such development process needs to deal with creativity and local knowledge, practice and beliefs. It is pertinent to note that people in the rural areas to which development efforts are directed to have their own body of knowledge that enables them arrive at decisions. This is expected to help them better their lots (Kolawole, 2016), because local people's knowledge, otherwise known as indigenous knowledge, which respects the expertise of indigenous people has come to be regarded as a major contribution to development thinking (Osunade, 2016). Any attempt to ignore this knowledge is tantamount to ensuring failure in development (Brokensha, 2015). Today, indigenous knowledge is seen as pivotal above all in discussions on sustainable resource use and balanced development

(Brokensha, 2015). Hence, the opinion of Drew (2016) that indigenous knowledge is an enabling competence of development.

Before the introduction of western technologies to the African society, farmers had their own body of knowledge in relation to their environment to modify, change and improve the existing production system in agriculture (Siyanbola & Agboola, 2017). They have over the years had constant experimentation to meet various needs. Traditional knowledge therefore, refers to the knowledge, innovations and practices of traditional and local communities around the world. This knowledge is transmitted orally from generation to generation. It tends to be collectively owned and it takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices.

According to Gorjestani (2017), Traditional knowledge (TK) could be seen as a significant resource which could contribute to the increased efficiency, effectiveness and sustainability of the development process. He further stressed that, TK is used at the local level by communities as the basis for decisions pertaining to food security, human and animal health, education, natural resources management, and other vital economic and social activities. He further referenced that TK is a key element of the social capital of the poor and constitutes the4ir main asset in their efforts to gain control of their own lives. Hence, the potential contribution of TK to locally managed, sustainable and cost-effective survival strategies should be promoted in the development process.

Knowledge, as a rule is closely related to such concepts as meaning information, instruction, communication, representation, learning and mental stimulus. A common definition of knowledge is that it consists of justified true belief; it is the awareness and understanding of facts, truths or information gained in the form of experience or learning. Knowledge is an appreciation of the possession of interconnected details which, in isolation are lesser value. Knowledge refers to what one knows and understands.

The demand for fish is very high due to its importance of human nutrition and for animal feed (fish meal and poultry feeds) its biological value in terms of high protein content and other nutrients account for the consumption of fish products as compared to other animal products source (Oluwatoyin, 2019) its amino acid profile low cholesterol, high vitamins and mineral content as well as fatty acid profile makes it stands out among sources of animal protein (Adewuyi, 2020)

Ibrahim (2018) reported that the most prominent methods of processing fish from lakes are smoking and drying due to power shortages. However, Oluwatoyin (2019) reported that salting, sun-drying, smoke drying and frying were the most popular processing and preservation techniques utilized by women as the procedure enhances desirable taste when moisture content is reduced to 10.9 and stored in dry place will prevent spoilage the results agree with the findings of Oluwatoyin (2019) who reported that smoking was the most preferable practice among women as it enhances desirable taste, flavour and increase shelf life. The fourth method of processing fish is fermentation.

Fisheries sector is an important source of food and livelihood for many people around the world (Cheke, 2019) fish provides vital source of protein and income for mainly families in the developing countries (Kolawole, 2019) about 200 million people throughout the world are estimated to depend on fish for all or part of their income (De Silva 2017) Harvest loss has been identified as one of the main sources of food insecurity in Africa. Africa countries pre- and post-harvest food losses are higher than the global average and impact more severely on already endangered livelihoods, Fish is an extremely perishable food commodity that experience loss at every stage of production from harvest to consumption.

Despite modern methods of fish processing, several studies revealed that fish smoking still remains the most preferred method of fish preservation in Nigeria, as

over 70% of catch is smoked (George, *et al.*, 2014; Okunade, 2018). In Nigeria, the quantity of smoked fish has been found to be within acceptable limits specified by various regulatory organizations (Afolabi, 2011). However, major problems are encountered in the traditional fish, smoking in West Africa, Nigeria inclusive mainly in the areas of smoking kiln, packaging of the product and general sanitary situation in the processing sites.

With the advancement in traditional smoking kiln, processing operations and still time and energy demanding, health and fire hazard and fuel inefficient with poor ventilation. Also, there is difficulties in controlling the temperature resulting to improper smoking while the construction materials used limits the durability of the kiln (oven) (Kolawole, 2017). Similarly, the indigenous/ local kiln is characterized by fuel/ wood scarcity whereby rendering at costly for fish smoking. The practice/method is also time consuming and wasteful due to the small quantity of fish that are smoked at a time. Though, smoking may impact on the nutritive value of traditional preserved fish but the overall quality has been demonstrated not to have significant difference from fresh raw fish, unknowingly to the processors, losses are encountered during the smoking procedures in traditional methods

Though fresh fish are processed without any significant loss of quality, but the most important loss in smoked fish production is the yield of finished products. However, the producers need to understand how smoking procedures affect the interrelationship between yields, throughput and profitability. There is death of information on how smoking procedures account for economic loses, hence attempts to fill the information gap formed the basics for the study.

Purpose of the Study

The general objective of the study is to assess the knowledge and use of traditional fish processing methods by fish processors in Lagos, Ogun and Ondo states, southwest, Nigeria. Specifically, the study tends to:

i. describe the socio-economic characteristics of fish processors in the study area;
ii. determine the respondents' level of knowledge of traditional methods of fish processing; and
iii. determine the respondents' level of utilization of traditional methods of fish processing in the study.

Research Questions

This study is expected to provide answers to the research questions:

1. What are the socio economic characteristics of fish processors in the study area?
2. Do respondents have knowledge of traditional methods of fish processing in the study area?
3. Do respondents have knowledge of traditional method of fish processing in the study area?

Hypotheses

Ho_1: There is no significant difference between socio-economic characteristics of fish processors and their use of traditional methods of fish processing.

Ho_2**:** There is no significant difference between constraints faced by fish processors and their use of traditional method of fish processing.

Methodology

The study adopted a descriptive survey research design. The population of the study comprise all the 3000 fish processors in Lagos, Ogun and Ondo State. This population includes both male and female fish processors who are heterogeneous in cultures and Language. Multi-stage sampling technique was used to select 300 respondents for the study. The data were obtained by face-to-face interview using pre-tested and validated structured interview schedule. The data were collected, coded and subjected to descriptive analyses such as frequency table

and percentages. Qualitative analysis was also employed to supplement the results from the quantitative analysis, inferential statistics procedure such as t-test between two sample means, and Chi- square test were used to test the hypotheses.

Results and Discussion

This represents the results, description and interpretation of data obtained from data administration. The results are presented, interpreted and discussed, findings on personal characteristics of respondents, analysis of the research questions, testing of the hypotheses, and discussions of the study's findings.

Table 1

Personal Characteristics of Traditional Fish Processors in the Study Area (n=300)

Characteristics	Categories	Frequency (f)	Percentage (%)
Sex	Male	168	56.0
	Female	132	44.0
Age	25-30 years	189	63.0
	31-40 years	51	17.0
	41-50 years	36	12.0
	51-60 years	24	8.0
Marital status	Single	222	74.0
	Married	78	26.0
	Separated	0	0.0
	Divorced	0	0.0
	Widowed	0	0.0
Status of formal education	Educated	291	97.0
	Uneducated	9	3.0
Highest level of education	No formal education	9	3.0
	Primary education (not completed)	3	1.0
	Primary education (completed)	3	1.0
	Secondary education (not completed)	3	1.0
	Secondary education (completed)	108	36.0
	Technical College	9	3.0
	Tertiary education	165	55.0
	Adult education	0	0.0
Status of non-formal education	Yes	153	51.0
	No	147	49.0
Non-formal education background	None	147	49.0
	Vocational education	96	32.0
	Religious education	36	12.0
	Extension education	21	7.0
Household size	Less than 3	12	4.0
	3-5	159	53.0
	6-8	99	33.0
	More than 8	30	10.0

Personal Characteristics of Respondents

This sub-section analyzed the personal characteristics of traditional fish processors in the selected study areas. The personal characteristics were discussed under the following: sex, age, marital status, status of formal education, educational attainment, status of non-formal education, background of non-form al Education, and household size.

Sex Distribution of Respondents

Results showed that there were more males (56.0%) than female (44.0%) involved in fish processing in the study area. This result is most likely attributed to the fact that the fishing areas covered in this study were inland waterways. It is often common to see male fisher folks engaged in both fish farming and fish processing activities in inland waterways during peak and lean seasons in Southern Nigeria.

Age of the Respondents

Results also present the age distribution of the respondents in the study area. Data showed that the age range of the respondents lied between 25 and 60 years. The larger proportion of the respondents fell between the age group of 25-30 years. This age group represented 63.0% (n= 189) of the total respondents. The next age group with the highest proportion among the respondents was 31-40 years. This age group represented 17.0% (n= 51) of the total respondents. About 12.0% of the respondents were between the age group, 41-50 years, and only 8.0% of the respondents were between the age group, 51-60 years. However, the mean age of fish processors was 28.63 of 3.11 years. The result means that the majority of the respondents were young fish processors.

Marital Status of the Respondents

Results showed that 74.0% of the respondents were single, and about 78 representing 26.0% of the respondents were married. This means that the majority of the fish processors in the study area were single. The result further showed that none of the fish processors was separated, divorced or widowed.

Formal Education Status

Data indicated that [97.0%] of the respondents had formal education, and 9 [3.0%] had no formal education. This finding means that the majority of the fish processors received formal education.

Educational Attainment

Data indicated that unequal number of the respondents had varying level of formal education. About 3.0% of the respondents had no formal education, 1.0% of the respondents attended primary school but did not complete primary education and the same proportion of the respondents (1.0%) attended primary school and completed primary education. Results also showed that about 111 (37.0%) of the respondents attended secondary school and only 3 (1.0%) did not complete secondary education, and 36.0% of the respondents completed secondary education. Only 3.0% of the fish processor attended Technical College, 55.0% were educated up to the tertiary educational level, and none of the fish processor received adult education. The high level of respondents' educational attainment could be adduced to the closeness of fish processors to a nearby higher education institution with the fishing area.

Status of Non-Formal Education

Results indicated that 51.0% of the respondents had non-formal education, and 147 representing 49.0% of the respondents received no form of non-formal education. This means that more than half of the fish processors received a form of non-formal education.

Background of Non-Formal Education

Data showed that the most common form of non-formal education received by the respondents was vocational education (32.0%) followed by religious education (12.0%) and then extension education (7.0%). This result implies that the majority of the fish processors benefited from non-formal education in aiding the fish processing business.

Household Size

It showed that only 4.0% of the respondents had a household size of less than 3 (that is, may include wife, husband, or children). More than half of the respondents, 159 representing 53.0% had a household size

of 3-5 members. About 33.0% of the respondents had a household size of 6-8 members, and 10.0% of the respondents had a household size of more than 8 members. The average household size recorded among the fish processors was 5.8 persons.

Table 2
Types of Fish Processed by Fish Processors

Types of Fish	Common Name	Total Respondents (N)	Frequency (f)	Percentage (%)
Oreochromisniloticus	Tilapia	300	243	81.0
Citharinuscitharus	Moon fish	300	225	75.0
Clariasgariepinus	Mud cat fish	300	207	69.0
Synodotismembranacus	Cat fish	300	174	58.0
Gymnacuusniloticus	Trunck fish	300	141	47.0
Chryistitisnigrodigitatus	Bagrid catfish	300	132	44.0
Heterotisniloticus	African slap water	300	78	26.0
Micropogonias undulates	Croaker fish	300	44	14.7
Malapteruruseletricus	Electric fish	300	13	4.3

Types of Fish/Shell Processed by Traditional Fish Processors

The types of fish processed by traditional fish processors in Southwestern Nigeria were specifically nine species. The most commonly processed fish was *Oreochromisniloticus* (Tilapia) by 81.0% of the respondents. Also, about 75.0% of traditional fish processors processed *Citharinuscitharus* (Moon fish). A considerable proportion of the respondents, 69.0% also reported that they engaged in *Clariasgariepinus* (Mud catfish) specie processing. More than half (58.0%) of the traditional fish processors also processed *Synodotismembranacus* (Cat fish).

Gymnacuusniloticus also known commonly as Trunck fish was processed by 47.0% of the respondents in the study area. *Chryistitisnigrodigitatus* with common name, Bagrid catfish was reported by 44.0% of the respondents as their main type of fish processing. About 26.0% and 14.7% of the respondents engaged in processing of *Heterotisniloticus* (African slap water fish) and *Micropogonias undulates* (Croaker fish) respectively. Few of the respondents, 4.3% engaged in *Malapteruruseletricus* (Electric fish) processing. The most common to the least types of fish processed by traditional fish processors is represented.

Hypotheses Testing

There is no significant relationship between socio-economic characteristics of fish processors and their use of traditional methods of fish processing.

Relationship between Respondents Socio-Economic Characteristics and Use of Traditional Methods of Fish Processing

The coefficients of correlation between socio-economic characteristics (sex, age, marital status, status of formal education, and household size) of respondents and use of TFPMs are presented. Results indicated that there was a significant positive correlation between sex of traditional fish processors and use of TFPMs (r= 0.514) at 5% and 1% levels of significance. This implies that there was significant relationship between gender of fish processors and their use of traditional methods of fish processing. Thus, the null hypothesis was rejected for the socio-economic characteristic of sex.

Results also indicated that there was a significant positive correlation between age of traditional fish processors and use of TFPMs (r= 0.620) at 5% and 1% levels of significance. This implies that there was significant relationship between age of fish processors and their use of traditional methods of fish processing. Thus, the null hypothesis was rejected for the socio-economic characteristic of age.

Further findings also revealed that there was a significant positive correlation between status of formal education of traditional fish processors and use of TFPMs (r= 0.371) at 5% level of significance. This implies that there was significant relationship between formal education status of fish processors and their use of traditional methods of fish processing. Thus, the null hypothesis was rejected for the socio-economic characteristic of educational status.

However, the socio-economic characteristics of marital status (r= 0.118, p> 0.05 and household size (r= 0.124, p > 0.05) were not significantly correlated with use of TFPMs. Thus, the null hypotheses based on these characteristics were not rejected.

Table 3

Correlation Matrix of Relationship between Socio-Economic Characteristics of Respondents and Use of TFPMs

Variables	Sex	Age	Marital status	Formal education status	Household size	Use of TFPMs
Sex	1					
Age	.283	1				
Marital status	.319*	-.116	1			
Formal education status	-.145	-.200	.305*	1		
Household size	.087	.680**	.050	.081	1	
Use of TFPMs	.514**	.620**	.118	.371*	.124	1

Note. TFPMs= Traditional fish processing methods
*p>0.05, **p>0.01

Use of TFPMs was a parameter measured based on the number of TFPMs used by a fish processor in the study area.
TFPMs= (Smoking, Sun drying, Fish frying, Salting and Burning)

Determinants of TFPMs Utilization

The socio-demographic determinant of utilization of traditional method of fish processing was conducted using factors such as sex, age, marital status, status of formal education, and household size. As presented in Table 4.2.3, sex (χ^2= 32.509, df=4, p < 0.05), age (χ^2= 120.101, df= 12, p < 0.05) and formal education status (χ^2= 48.364, df= 4, p < 0.05) were found to significantly determined the utilization of traditional methods of fish processing. Marital status (χ^2= 3.276, df= 4, p > 0.05) and household size (χ^2= 16.119, df= 12, p > 0.05) were socio-demographic factors not significantly associated with utilization of traditional methods of fish processing.

Based on the significant association of sex with utilization of traditional methods, it was found that the majority of male fish processors utilized burning processing method (80.0%), salting processing method (74.1%) and sun drying processing method (66.7%) while the majority of female fish processors utilized smoking processing method (64.1%) and fish frying processing method (62.2%).

Based on the significant association of age with utilization of traditional methods, it was found that the majority of fish processors within the age range 25-30 years utilized burning processing method (73.3%). The majority of fish processors between the age range 31-40 years utilized fish frying processing method (68.9%) while those within the age range 41-50 years utilized smoking processing method (49.1%).

Based on the significant association of status of formal education with utilization of traditional methods, it was found that majority of fish processors with formal education utilized smoking processing method (94.2%), sun drying processing method (91.2%), fish frying processing method (93.3%) and salting processing method (92.6%) while the majority of fish

processors without formal education utilized burning processing method (60.0%).

Conclusion

The study investigated the assessment of the knowledge and use of Traditional methods of fish processing in Southwest Nigeria. Based on the empirical discoveries in the study, the following are the findings: The most common traditional methods of fish processing in the study areas were smoking fish flat, smoking fish coiled, smoking fish with incision, smoking on racket, smoking fish cut into chunks, burning fish, sun drying fish and frying fish. The implication of this is that efforts at fish processing technology development and transfer should consider these methods in order to stop waste of time and resources and also reduce post-harvest losses, to ensure sustainable development.

The age distribution of the processors is 25 – 30 years which enhances their active involvement in fish processing, male processors also play significant role in fish processing. A higher percentage of respondents in both maritime and inland (55.0%) had formal education while some of the fish processors that have non-formal education acquired different skill such as harvesting, hatching, preservation and pond management. Only 7. 0% of the respondents in maritime and inland had extension education.

Maritime states significant variable to the use of traditional method includes sex ($r = 0.514$ $p > 0.05$), age $r = 0.620$, $p > 0.05$), formal education $r = 0.371$, $p > 0.05$, marital status $r = 0.0118$, $p > 0.05$. Method of traditional fish processing $F = 148.653$, $p < 0.05$.

Recommendation

Based on the empirical findings of the study the following recommendation is made: Non-Governmental organizations and Governmental organization should encourage, develop and provide equipment that will enhance traditional fish processing method by fish processors use in the study area such as water pumps, seine peels, Aerators, Generators, Grading Equipment, weight scale and Automatic fish feeders.

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IMPACT OF THE WORLD BANK ASSISTED SMALLHOLDER OIL PALM PROJECT: A CASE STUDY OF EKUKU-AGBOR

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Abstract
This study assessed how the World Bank Assisted Smallholder Oil Palm Project (WBASOPP) impacted on the rural agricultural economy of Ekuku-Agbor, Ika South LGA, Delta State. It was aimed at resuscitating the ailing oil palm industry in Nigeria located in Ekuku-Agbor in the defunct Bendel State, in order to increase the income levels of smallholder farmers and enhance their economic opportunities, through oil palm production, between 1975 and 1983. It was an expost facto design. Data was gathered using structured interviews, focus group discussions and review of archival documents; and analyzed with means, grand mean descriptive statistics. The results obtained from the study revealed that WBASOPP scheme has had positive impact on the rural economic growth in Ekuku-Agbor, due to increased levels of smallholder oil palm production, more of oil palm farmers and businesses across the value chain, more smallholder plantations and enhanced processing and marketing capacities. There was a greater sense of community and social wellbeing, suggesting that WBASOPP had been positively impactful on the rural economic growth and development of Ekuku-Agbor. More of such World Bank Assisted Smallholder projects were recommended for other places.

Keywords: World Bank smallholder farmers, oil palm, rural economy, value chain.

Introduction

Oil Palm *(Elaeis guineensis)* is a tree crop that is largely grown in Southern Nigeria, which yields many products like palm oil, palm kernel oil, palm wine, fronds and other by-products that have high economic value for farms and society. The African oil palm is native to West Africa and is likely the world's most important palm species (Cosiaux, *et al.*, 2018). Cultivation of oil palm as a crop was originally an informal process, mainly confined to the West African/Central African coastal belt, between Guinea/Liberia and Northern Angola, (Corley & Tinker, 2015). Nigeria was a net exporter of oil palm products, especially palm oil and palm kernel seeds, (up to 45%), that rose to about 58% in 1980 (Asikadi, 1992). In its region of origin, the oil palm plant has great significance to local people and for wider biodiversity (Cosiaux, *et al*., 2018; Reddy, *et al.*, 2019; Okolo, *et al*., 2019). This is especially because of the two contrasting types of oil found in the tissues of palm fruits, namely palm oil and palm kernel oil (Murphy, 2019).

Oil palm is regarded as a multipurpose tree crop symbolizing nature's endowment to the people of South-East, Nigeria. According to Okolo, *et al.* (2019), the oil palm is viewed as closely interwoven with the people, providing their requirements in terms of food, medicine and materials for infrastructural development. The Eastern Region government had been carrying out rehabilitation of oil palm plantations with the support of the World Bank under the Oil Palm Rehabiliation Scheme (OPRS) in the 1962-1968 Development period. Much of oil palm cultivation in Nigeria is through smallholder oil palm units. These smallholder oil palm units serve important roles in providing income and employment (Murphy, 2015; Euler, *et al*., 2016). Hamblock (2018), stated that smallholders account for 30 to 40% of global land oil palm cultivation as shown by a recent study of global distribution of smallholder and industrial plantations at high resolution (Descals, *et al.*, 2020). Small holdings of oil palm can have lower environmental impacts and higher

biodiversity levels compared to commercial plantations (Razak, *et al.*, 2020).

After the Nigerian Civil War, the federal government sought the support of the World Bank to develop smallholder oil palm units under the World Bank Assisted Smallholder Oil Palm Project. The World Bank Group with its primary mission of poverty reduction sees the oil palm sector as an important contributor to furthering economic development in many developing countries (The WBG's Framework for Engagement in the Oil Palm Sector).

The Federal Government of Nigeria sought the support of the World Bank to develop smallholder oil palm units under the World Bank Assisted Smallholder Oil Palm Project and this support culminated in the establishment of two such units in the rural communities of Mosogar and Ekuku-Agbor in Old Bendel State, under the Tree Crop Unit of the Ministry of Agriculture and Natural Resources (1975 – 1983). This was then under Delta State Government after the creation of Edo and Delta States out of the defunct Bendel State. Orewa (2008) reported that the World Bank Assisted Smallholder Oil Palm Project (WBASOPP) focused on new plantings while financing was jointly implemented by the World Bank in partnership with the Federal Government of Nigeria and the concerned state government. The expectation of this project was that, through it the underlisted developments would occur:

a. there would be increased production of oil palm produce
b. there would be an increased demand for palm oil, palm kernel seeds and other oil palm by-products
c. there would be increased rural employment of people
d. application of modern, effective technologies in oil palm production through use of high yielding hybrid varieties of oil palm planting materials, application of fertilizers and agro-chemicals as well as deployment of modern processing facilities;
e. increased hectarages under oil palm smallholder cultivation and
f. overall upliftment of the rural economy of the community.

Today, Nigeria is the fifth highest producer of oil palm globally, with an annual output of 1.0 million tonnes, (MT), although this is dwarfed by Indonesia with 42.5 M.T. and Malaysia with 18.5 M.T. (Statista, 2020). Due to the profitability, there are emerging oil palm industries in much of tropical Africa with Nigeria, Ghana, Ivory coast, Cameroon, Sierra Leon, Benin, Angola and Democratic Republic of Congo (DRC) as the main producers (in that order) (Paterson, 2021a).

Euler, *et al.*, (2016), showed in a study that oil palm adoption improves household living standards among smallholder farmers in Jambi Province, Sumatra, Indonesia. The Nigerian smallholder processors were oil palm processing wastes (shell, chaffi, empty fruit bunch (EFB) and fibre) directly to fuel boilers for fruit cooking, while diesel powered engine is used for digestion (Ohimain & Izah, 2014).

As stated by Ohimain and Izah, (2014), continuing global demands over the past five decades have meant that the cultivation of oil palm had been widely regarded by many tropical countries as a method to boost their economies. This was largely based on smallholder and plantation cultivation of oil palm, but the more impactful on community or rural life had been through smallholder units, especially in Nigeria. Smallholders account for 30 to 40% of global land oil palm cultivation (Humblock, 2018) and they range in size from 1-2 ha to 50ha (Euler et al, 2016). A recent study showed the global distribution of smallholder and industrial plantations at high resolutions (Descals, *et al.*, 2020). In parts of Indonesia and Africa, oil palm can be regarded as key elements in local food security and economic wellbeing (Krishna, *et al.* 2017; Kubitza, *et al.* (2018). Razak, *et al.* (2020) opined that in addition, small holdings of oil palm can have lower environmental impacts and higher biodiversity levels,

compared to commercial plantations. Looking at all the views on Oil Palm cultivation in the tropics, it became imperative to assess the impact of the World-Bank Assisted oil palm Project on the rural community of Ekuku-Agbor in the present times. Currently, many enterprises were springing up in Ekuku-Agbor community built around the oil palm industry, leading to the emergence of oil palm-based entrepreneurships across its value chain. Tibi (2023) stated that entrepreneurship is not established in a vacuum; rather, it exists on an occupational or vocational platform, in which new enterprises are innovated upon, by extracting gaps and opportunities across the value chain of traditional livelihood ventures and creating profitable products/services from them.

The challenge that had necessitated this study was that after several decades of the implementation of WBASOPP, there had been obvious transformation in Ekuku-Agbor Community, as it pertains to the rural economy of the town. Indonesia's recent smallholder-led palm oil expansion provides an important case study of how geographically dispersed pro-poor growth can reach remote rural regions (Edwards, 2016). This study therefore sought to investigate how much the transformation in Ekuku –Agbor had been contributed by the influence of the WBASOPP intervention in the oil palm enterprise. It was hoped that if this had added value to the community, it would mean that such a scheme could be replicated in other rural communities and even for other crops than oil palm. If not so, then recommendation could be made on the remediation of the oil palm farming in the locality, by employing other improvement schemes in future.

Purpose of the Study

The main purpose of this study was to investigate whether the WBASOPP scheme had any observable impact on the rural agricultural economy of Ekuku-Agbor since inception, up till the present period. Specifically, this study sought to determine whether there was:

i. an increase in the oil palm production in the community to determine whether more people became engaged in the oil palm sector of the rural economy;
ii. any increase in demand and supply for oil palm products/produce;
iii. any effect of the oil palm industry on farmlands in the community;
iv. the use of modern technologies processing of oil palm products; and
v. an overall enhancement of the rural economy on account of oil palm production since WBASOPP scheme.

Research Questions

Some research questions were raised to guide this study as follows:

1. Was there an observable increase in oil palm production?
2. Was there a comparable increase in the number of participants in the oil palm sector?
3. Was there a visible increase in the demand and supply of oil palm products/produce?
4. Did oil palm production have effect on farmlands in the community?
5. Were modern technologies deployed in the processing of oil palm products?
6. Was there an enhancement in the rural economy due to oil palm promotion in the community?

Methodology

This ex-post facto research design combined with focus group adopted structured interview format, using the likert scale questionnaire. Six (6) research questions were raised to guide the study. Being a case study, the population of the study comprised of smallholder oil palm farmers, commercial oil palm millers, palm oil marketers, palm kernel seed marketers, oil palm input sellers in Ekuku Agbor numbering about 250 persons. A simple random sampling of this population resulted in the selection of an admixture of 35 respondents who were interviewed using a structured

questionnaire called WBASOPP interview questionnaire (WBASOPPIQ) to elicit responses from the respondents. It consisted of 48 items, grouped into 6 subsections according to the six (6) research questions. This instrument was validated by four experts from University of Delta, Agbor and Dennis Osadebe University, Asaba while its internal consistency was tested using Cronbach Alpha, which yielded a reliability coefficient of 0.81. Means ($\bar{x}$) grand mean ($\bar{X}$) and standard deviation (SD) were the descriptive statistics used to answer the research questions. The questionnaire items each had a four-point rating scale of (1) Strongly Disagreed (SD), (2) Disagreed (D), (3) Agreed (A), and (4) Strongly Agreed (SA). Grand mean was used to take a decision on each research question.

Grand Mean is $XGM = \frac{Ex}{N}$

N – Total Number of sets

Ex – Sum of the mean of all sets.

For the research questions, a mean score of 2.50 for any item, was adjudged as an indication of positive impact of WBASOPP scheme on the rural economy. The interviews were conducted on the respondents with the help of three (3) research assistants from the University of Delta, Agbor.

Results

Research Question

Was there an observable increase in oil palm production?

Table 1

Increase in Oil Palm Production

S/No	Item	$\bar{X}$	SD	Remark
1	Increased oil palm output	3.43	0.89	SA
2	More Fresh Fruit Bunches (FFB)	3.42	0.90	SA
3	More Palm Oil in 30 litre kegs	3.28	0.84	A
4	More palm kernel seeds (PKS)	2.85	0.94	A
5	More hectares of Oil Palm Production	3.27	0.93	A
6	More Smallholder oil palm farms	3.43	0.92	SA
7	Increased hectares/oil palm units farm	2.38	071	A
	Grand Mean (X)	**2.86**		

Table 1 as presented indicated that six items 1,2,3,4,5 and 6 had mean values ranging from 2.85 to 3.43 which were all above the decision score of 2.50 meaning that WBASOPP scheme impacted positively with regards to increase in oil palm production, except for item 7 with mean rating of 2.38 for increased hectarage per oil palm unit farms. A grand mean of 2.86 was obtained, which is higher than the decision score of 2.50. This means that there was no increase on the sizes of the smallholder farm units. This supported the view of Orewa (2008) that smallholder farm units range from 1.57 to 2.00 hectares due to fragmentation of farm lands, as a result of the land tenure system being practiced in the community. The standard deviation for each item's mean rating ranged from 0.71 to 0.94 for all seven items, meaning that there was closeness or near similarity in the responses of the respondents. The grand mean of 2.86 showed that there was observable increase in oil palm production since the inception of WBASOPP up till the present day.

Research Question 2

Was there a comparable increase in the number of participants in the oil palm sector?

Table 2
Increase in Number of Participants Across the Oil Palm Value Chain

S/No	Item	$\bar{X}$	SD	Remark
1	More smallholder participant in oil palm production	3.26	0.84	SA
2	More participant in oil palm value chain	3.26	0.80	SA
3	Increase in the number of harvesters	2.68	0.50	A
4	Increase in the number of millers	3.30	0.92	SA
5	Increase in the number of kernel crackers	3.33	0.76	SA
6	Increase in the number of oil palm traders	3.44	0.66	SA
7	Increase in the number of marketers of inputs for oil palm	3.82	0.30	SA
8	Increase in the number of distributors	3.12	0.80	SA
9	Increase in the number of Palm wine tappers	2.42	0.51	D
10	Increase in people selling seedlings to farmers	2.55	0.79	A
	Grand Mean (X)	**3.118**		

The data presented in table 2, revealed that all eleven items which had mean ratings ranging from 2.55 to 3.44 were higher than the decision point of 2.50 and so indicated that there were increases in the number of participants in the various enterprises across the oil palm value chain, following the introduction of the WBASOPP scheme in Ekuku-Agbor. Though there were slight gaps in items 3, 7 and 10, with regards to the standard deviation of each item, there seemed to be consensus that there was increase in the number and variations of participants in the oil palm value chain. The grand mean of 3.118 showed that WBASOPP brought innovation to the oil palm industry, and created opportunities for more entrepreneurs to emerge on the community's landscape, thus ushering in prosperity and social upliftment of the community.

Research Question 3
Was there a visible increase in the demand/supply of oil palm produce/products?

Table 3
Increase in Demand/Supply of Oil Palm Produce/Products

S/No	Item	$\bar{X}$	SD	Remark
1	Fresh Fruit Bunches (FFB)	3.08	0.78	A
2	Palm Oil	3.18	0.87	SA
3	Palm Kernel Seeds	2.95	0.81	A
4	Palm kernel shells	2.51	0.91	A
5	Palm wine drink	1.62	0.80	SD
6	Oil Palm Seedlings	3.45	0.64	SA
	Grand Mean (X)	**2.79**		

The data obtained from the respondents from the items in this section showed that out of the six items, mean ratings for items 1, 2, 3, 4 and 6 ranged from 2.51 to 3.45, indicating that there were increases in the demand and supply of all items listed, except for item number 5, which was palm wine drink that was rated 1.62, which was below the decision point of 2.50. Apparently, palm wine drink still remained a local byproduct of oil palm production and so its demand and consequent supply remained a subsistent affair. The grand mean of 2.79 showed that there was a visible increase in the demand and supply of oil palm produce/products in Ekuku-Agbor.

Research Question 4
Did oil palm production have effect on farmlands in the community?

Table 4
Oil Palm Production's Effect on Farm Lands in the Community

S/No	Item	$\bar{X}$	SD	Remark
1	More farm lands under oil palm cultivation	3.05	0.77	SA
2	Increase in smallholder oil palm units	2.89	0.80	A
3	Increase in hectarage per oil palm smallholder farms	1.53	0.64	SD
4	Increase in sole planting of oil palm without inter cropping (early years)	1.43	0.87	SD
5	Loss of more farmlands to oil palm cultivation	3.43	0.92	SA
	Grand Mean (X)	**2.47**		

Data presented in table 4 showed that items Nos 1,2, and 5 respectively, had mean ratings that indicated more farmlands came under oil palm cultivation, (3.05), there was increase in the number of smallholder farms under oil palm cultivation (2.89) and there was loss of more farm lands to oil palm cultivation (3.43). However, item 3, revealed that hectarage of smallholder units did not increase (1.53) as observed by Orewa (2008) that each farmland ranged from 1.57 to 2.00 hectares, while item 4 showed that respondents maintained that farmers insisted on retaining the cultural practice of intercropping oil palm with other crops like maize, cassava, melon and okra as noted for the first few years, before allowing oil palm to become the sole crop on the farm lands. Thus, while there was increase in the number of smallholder oil palm farms in the community, the individual farm units never expanded their sizes beyond the smallholder unit sizes of between 1.57 to 2.00 hectares each. Grand mean of 2.47 showed that there was negative impact on farm lands in the community.

Research Question 5
Were modern technologies deployed in the processing of oil palm products?

Table 5
Modern Technologies Used in the Processing of Oil Palm

S/No	Item	$\bar{X}$	SD	Remark
1	Use of improved seedlings (hybrids)	3.20	0.77	SA
2	Use of agro chemicals like herbicides, fertilizers	3.21	0.71	SA
3	Use of modern milling equipment	2.92	0.68	A
4	Use of modern preservative equipment for palm oil	2.62	0.68	A
5	Bottling of palm wine drink	1.01	0.80	SD
6	Extraction of palm kernel oil with modern equipment	2.10	0.73	D
	Grand Mean (X)	**2.51**		

Data presented in table 5 showed that items 1,2,3 and 4, that the mean ratings of these 4 items by respondents indicated that modern technologies and resources were deployed in processing of oil palm resources, while the items 5 and 6 which had mean ratings below the decision point of 2.50, that is item 5 (1.01) and item, 6 (2.10) showed that palm wine and palm kernel seed oil were not being processed with modern technologies and resources, probably because of their limited local consumption and utility values, respectively. Grand mean of 2.51 showed that modern technologies had been introduced into processing of oil palm products.

Research Question 6
Was there an enhancement in the rural economy due to oil palm promotion in the community?

Table 6
Enhancement of the General Rural Economy Due to WBASOPP Scheme

S/No	Item	$\bar{X}$	SD	Remark
1	More farmers shifted to oil palm production	2.91	0.68	A
2	More modern processing facilities in the community	3.60	0.75	SA
3	More persons engage in oil palm enterprises	3.82	0.39	SA
4	Ekuku-agbor became a hub for oil palm business	3.53	0.50	SA
5	Oil palm business became a daily affair, not on	3.63	0.94	SA
6	More people procured FFB outside for processing in Ekuku-Agbor	2.92	0.67	A
7	Ekuku Agbor elites settled into the business in the community	3.53	0.50	SA
8	Oil palm business started radiating from Ekuku-Agbor to other communities	3.53	0.52	SA
9	Overall prosperity in the community from oil palm	3.72	0.45	SA
10	Prospects for expansion in the oil palm value chain in future	3.18	0.58	SA
11	Improved social amenities like schools, clinics hospitality centres, road network emerged	3.21	0.70	SA
	Grand Mean (X)	**3.41**		

As shown in Table 6, data on all items 1 to 11 had mean scores above the cut-off point of 2.50, implying that WBASOPP scheme had impacted positively on the rural agricultural economy of Ekuku-Agbor, thereby leading to the overall economic upliftment of the community. It had removed the community from subsistence agriculture and placed it as a community noted for commercial oil palm farming. Most people living in Ekuku-Agbor had joined the oil palm industry across its several viable value chains, in one way or the other. Others had been attracted into the oil palm industry from outside the community, and there was an enhancement of the living conditions of people due to the oil palm industry. The grand mean of 3.41 indicated that there was general enhancement of the rural economy of Ekuku-Agbor Community due to oil palm promotion.

Discussion of Findings

The purpose of this study was to assess whether the World Bank Assisted Smallholder Oil Palm Project launched in Ekuku-Agbor Community of Delta State in the 1975 – 1983 Tree Crops Unit Development Programme, had any observable impact on the rural agricultural economy of the town, since inception till the present day. In order to verify this, six (6) research questions were raised and data gathered were analyzed to reveal a number of things.

On the issue of oil palm production, data revealed that there had been increased production of oil palm, in terms of more smallholder farms, with commensurate product outputs, more hectarages under oil palm cultivation and increased yields per hectare of planted fields. This was supported by Peterson (2021a) who stated that with increased production of oil palm in Nigeria, involving smallholders and plantation, Nigeria is currently the fifth highest producer, globally. Also, smallholder farm account for 30 to 40% of global land under oil palm cultivation (Hamblock, 2018) and they range in size from 1ha to 50 ha, as stated by Euler, *et al.* (2016). However, it was noted that the oil palm farm sizes in Ekuku-Agbor, had not expanded, but were still small holding units of 1ha to 2ha, which increased in number of such units, as noted by Orewa (2008).

In the area of number of smallholder farmers in oil palm, data showed that more farmers engaged in oil palm production as

well as in the various enterprise under its value chair (Orewa, 2008). Such enterprises included increased number and variety of entrepreneurs like oil palm farmers, palm oil millers, palm kernel crackers, marketers, distributors, input suppliers like oil palm seedlings, agro-chemicals, machinery etc. Okolo, *et al.* (2019) had earlier espoused that the oil palm is closely interwoven with the people, providing them requirements in terms of food, medicine and materials for infrastructural development, a view supported by Eule, *et al.* (2016) and Hamblock, (2018). Tibi (2023) had recognized oil palm production as one of the new enterprises that entrepreneurs were innovating on by filling gaps in occupational value chains.

As for demand and supply of oil palm produce/products, data showed that these increased proportionately, thus generating more enterprises and entrepreneurs. In parts of Indonesia and Africa, oil palm can be regarded as key elements in local food security and economic well-being (Krishna, *et al.*, 2017; Kubitza, *et al.*, 2018). A corollary to this was that more farmlands in Ekuku-Agbor were converted to smallholder oil palm farms, while hectarage of farm units remained the same (1 to 2 ha per unit) as opined by Orewa (2008), supported by Euler, *et al.*, Carlson, *et al.*, (2018), Santika, *et al.*, (2021) and Oosterveer, (2020).

With regards to whether oil palm production had effect on farmlands in the community, data revealed that oil palm production impacted negatively on farmlands by reducing the lands available for other agricultural and economical activities (Grand Mean was 2.47). Thus, while the number of smallholder farm units increased in Ekuku-Agbor, the individual farm units retained their small hectarages of 1.5 to 2 ha (Orewa, 2008). However, the small holding units did play significant roles in boosting oil palm production (Paterson, *et al.*, 2021a). Moreover, small holdings of oil palm can have lower environmental impacts and higher biodiversity levels compared to commercial plantations (Rasak, *et al.*, 2020).

Regarding the issue of use of technologies in production and processing of oil palm, data revealed that these were deployed in oil palm production and processing, ranging from land preparation, through planting, maintenance, harvesting, processing and marketing. This was in line with the focus of the world Bank Assisted Smallholder Oil Palm Project, as a way of improving the agricultural economy of the rural community, (The World Bank Report April 3rd, 2011). Edwards (2016) had observed that Indonesia's recent smallholder led oil palm expansion provided an important case study of how geographically dispersed pro-poor growth could reach remote rural regions. However, the Nigerian smallholder processors use oil palm processing wastes (shells, chaff, empty fruit bunch, EFB and fibre) directly to fuel boilers for fruit cooking, while diesel-powered engine is used for digestion of the fruit (Ohimain & Izah, 2014).

Data generated on research question 6, as regards whether the WBASOPP scheme led to the enhancement of the economy, the grand mean of 3.41 indicated that there was general enhancement of the rural agricultural economy of Ekuku-Agbor community due to oil palm production. It had removed the community from subsistence agriculture and placed it on commercial oil palm enterprises. Several authorities had espoused on how oil palm farming, especially the smallholding units had improved the economy of rural communities, uplifted their living standards, attracted social amenities and specially created many enterprises and made many entrepreneurs (Euler, *et al.*, 2016, Carlson, *et al.*, 2018, Murphy 2019, Oosterveer, 2020) and Peterson, (2021a). The existence of smallholder oil palm farms on nearly all the farmlands in Ekuku-Agbor community, establishment of functional palm oil and palm kernel seed processing plants all over the place, the ubiquitous daily presence of mid-size lorries, vans and trucks evacuating 25-litre kegs of palm oil, attested to how oil palm farming had transformed the economy of the town and surrounding environs.

Conclusion

Judging from the observations made about how much the World Bank Assisted Smallholder Oil Palm Project impacted on the community under study, it became meaningful to conclude that, the intervention at the time might have had direct positive effect in preparing the community for the emergent oil palm-driven prosperity being witnessed there, while also creating opportunities for many people to become gainfully employed in the various enterprises in the oil palm industry. Moreover, this study had brought about far-reaching educational implications, in the sense that the lessons derived from it could be replicated in other rural agricultural communities for oil palm or other agricultural undertakings that would serve in uplifting such places.

Recommendations

1. Government should continue to partner with international organizations like The World Bank, International Fund for Agricultural Development (IFAD) and Food and Agricultural Organisation (FAO) in order to institute similar interventions in rural agricultural communities of Nigeria and other African countries in need for transformation of their rural economies.
2. Enhancement of extension service delivery on benefits of oil palm cultivation using modern techniques and technologies in rural communities.
3. Remediation of soils, biodiversity and use of cultivars that adapt to climate change and disease resistant varities should be encouraged amongst smallholding farm units.

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INTEGRATING ICT INTO AGRICULTURAL EDUCATION FOR SUSTAINABLE FOOD SECURITY AND GLOBAL COMPETITIVENESS IN NIGERIA

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Abstract
This paper critically examined the meaning of Agricultural Education, the roles of Agricultural Education towards sustainable food security in Nigeria for global competitiveness, the place of SDGs in sustainable food security and global competitiveness. It also discusses the concept and importance of ICT in teaching and learning situation, advantages of using ICT in class room lessons, importance of ICT to the teachers among others. More so, the paper discusses the challenges faced by teachers of ICT in the class room situation. The paper recommended among others that policy makers should be objective in the making and implementation of education policy in Nigeria, as it affects ICT, emphasis should be placed on ICT education, as against the educational system we are currently operating that does not give adequate attention to the use of ICT in the class room and that this can be achieved if the government can provide the relevant ICT facilities in the education sector.

Keywords: Agricultural Education, ICT, sustainable food security and global competitiveness.

Introduction

Education is dynamic and so change is inevitable, however the introduction of ICT in other sectors of the economy like banking, companies, medicine, agriculture, law, education etc. has brought about obvious positive changes and improvement in those sectors. Hence, agriculture which is the mother of all other professions cannot afford to lag behind. Introduction and use of ICT in the 21st Century will help in shifting the stress encountered by teachers to the digital gadgets, the classroom will be digitalized or computerized where both the teacher and the students will find it easy to teach and learn respectively. The successful management of any 21st Century classroom is dependent on the ability to manage and transmit information (Nwachukwu, 2007). ICT has brought significant changes on the way that both teachers and students play, live and work. The world is quick growing and becoming more technological in nature, and learning in a digitalized world is as easy as saying alphabets which implies that the work load of the teachers and students will be reduced and simplified. More so, the era of manual teaching has gone and now we are advancing to the world of 21st Century, where virtually everything is digitalized, hence the need for quick compliance to the new trend in line with other developed countries of the world (Nwachukwu, 2007). The task of accelerating agricultural growth is primarily that of technological skills, and good farm organization and the main aim of price policies should be to avoid retarding or even frustrating the major technological skills and the efficient farm organization efforts in agricultural productivity (Odjegba, Kachukwu & Odjegba, 2021).

The 21st Century is being characterized by technological sophistication, cultural dynamism, socio-economic transformation and a changing competitive order occasioned by the wind of globalization. This phenomenon has opened up a lot of challenges which have far reaching implication for the well-being of the world economy. All nations should therefore respond positively to these challenges and undergo systematic change to remain

economically vibrant and competitive (Onoriode & Odjegba, 2010). Arimoro (2022), Khator, Miller and Igbinosa (2024) opined that in Nigeria, such response saw the adoption of Sustainable Development Goals (SDGs) and the Universal Basic Education (UBE) schemes which focus on poverty reduction and access to education respectively.

According to UNDP (2024) the Sustainable Development Goals (SDG) is also known as Global Goals, it is a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. The SDGs are designed to end poverty, hunger, AIDS, and discrimination against women and girls. The creativity, knowhow, technology and financial resources from all of society are necessary to achieve the SDGs in every context (UNDP, 2024). The seventeen (17) Sustainable Development Goals (SDG) according to UNDP (2004) are as follows:

1. No Poverty: End Poverty in all its forms everywhere.
2. Zero Hunger: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
3. Good Health and Well-Being: Ensure healthy lives and promote well-being for all at all ages.
4. Quality Education: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5. Gender Equality: Achieve gender equality and empower all women and girls.
6. Clean Water and Sanitation: Ensure availability and sustainable management of water and sanitation for all.
7. Affordable and Clean Energy: Ensure access to affordable, reliable, sustainable and modern energy for all.
8. Decent Work and Economic Growth: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
9. Industry, Innovation and infrastructure: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
10. Reduced inequality: Reduce inequality within and among countries.
11. Sustainable cities and communities: Make cities and human settlements inclusive, safe, resilient and sustainable.
12. Responsible consumption and production: Ensure sustainable consumption and production patterns.
13. Climate action: Take urgent action to combat climate change and its impacts.
14. Life below water: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
15. Life on Land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.
16. Peace, Justice and Strong Institutions: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
17. Partnerships: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

However, Onoriode and Odjegba (2010) noted emphatically that the overall objective of these strategies is to place Nigeria in its right place in the world economy, using technology education as the springboard. The height of development of any nation finds its root in education, as it pervades every sphere of a nation's life in pursuit of self-sustainability. This underscores the need for nations to effectively articulate and pursue educational policies that best suit their peculiar situation and development agenda.

Conceptual Clarification

Agricultural Education

Agricultural Education is the type of education that is employed in training learners in the improved agricultural production processes, as well as in the techniques for the teaching of agriculture. It therefore takes place at two levels, namely; formal level, which would take place at the primary, secondary to graduate study in the University; and at the informal level which goes on outside the formal school system (Egbule, 2004). Achal (2023) argued that agricultural education is the study of agriculture, food, and natural resources. It encompasses the entire food system from production to consumption. Agricultural educators teach students about the science behind food production, as well as the business and economics of the agriculture industry. Agricultural education studies agriculture, agricultural science, and related subjects. Egbule (2004) and Achal (2023) opined that agricultural education includes instruction in animal husbandry, crop production, agronomy, horticulture, farm management, agricultural engineering, agricultural mechanization, and other agro allied subjects.

Furthermore, Egbule (2004) and Achal (2023) reported that agricultural education also deals with instruction in agriculture, useful to farmers, to those engaged in non-farm agricultural occupations and to all persons as part of their general education. It is the training of learners in the processes of agricultural productivity, as well as in the technique for the teaching of agriculture. It is teacher preparation in agriculture production and in pedagogical skills in agricultural subject matter area (Egbule, 2004 & Achal, 2023).

According to Achal (2023) few people realize the importance of agricultural education with respect to national growth and development. Agricultural education is one of the most crucial aspects of our present-day society. Agricultural education teaches students about the process of food production and helps them understand where their food comes from. It also prepares students for careers in agriculture and related fields. Agricultural education is essential for the future of our country and our world (Achal, 2023). Agricultural education helps students understand where their food comes from and the science and technology that goes into its production. This knowledge can help them make informed judgment about the food they consume and products they purchase. Accordingly, knowing how our food is produced can make a better choice about the food and the products we buy (Achal, 2023). Achal (2023) stated that agricultural education can teach students about the care and management of animals and the science behind keeping them healthy. Such knowledge can be useful for those interested in careers in animal husbandry, veterinary science, crop production, and other related fields. It can also help students understand the importance of animal welfare and the ethical considerations involved in animal husbandry (Achal, 2023).

More so, Arnold (2023) depicted that Agriculture provides most of the world's food and fabrics. Cotton, wool, and leather are all agricultural products. Agriculture also provides wood for construction and paper products. These products, as well as the agricultural methods used, according to Arnold (2023) may vary from one part of the world to another. Vandal (2023) reported that Agricultural education is the systematic and organized teaching, instruction and training (theoretical as well as fieldwork-based) available to students, farmers or individuals interested in agriculture (animal and plant production) as well as the management of land, environment and natural resources.

The World Book Encyclopedia (2024) stated that "Agricultural Education deals with instruction in agriculture, useful to farmer, to those engaged in non-farm agricultural occupations and to all persons as part of their general education" it is "the training of learners in the processes of agricultural productivity, as well as in the techniques for the teaching of agriculture. It is teacher preparation in agricultural

production and in pedagogical skills in agricultural subject matter areas.

Needs for Agricultural Education for Sustainable Food Security

Meludu, *et al.* (2009) stated that about Three Million people in Africa are presently faced with food shortages and the efforts of these people to meet their food and nutrition needs would definitely be increased in the future. It is against this background that the need for technology-based Agricultural Education cannot be over emphasized. The agricultural industry according to Onviqa (2023) is undergoing a profound transformation, driven by the rapid advancements in digital technology. Traditional farming practices as depicted by Onviqa (2023) are being revolutionized as farmers embrace the power of digital tools, data analytics, and connectivity to optimize their operations and improve productivity. This digital revolution in farming holds the potential to reshape the future of agriculture, enabling sustainable practices, precise resource management, and enhanced decision-making (Arnold, 2023 & Onviqa, 2023).

Ifeanyieze (2010) noted that farmers today operate in a complex work environment in which new skills, knowledge, attitudes and information are required for the farmers to survive. Farmers have to learn to make decisions in farm management. Moreover, modern farming is fraught with risks, and if these risks are to be taken, farmers not only have to learn competent agricultural leadership skills, they must as well learn to cooperate and support one another in agricultural productivity. It is documented that over 70% of agricultural labour force participating in agricultural productivity, like bush clearing, planting, weeding, harvesting, food processing and preservation are women, and to achieve self-sufficiency in food, women must have access to and encouraged in education and training in Science and Technology (Ifeanyieze, 2010).

Ifeanyieze (2010) stated that Agricultural Education is concerned with imparting of knowledge, skills and attitudes in agriculture and in teaching by competent graduate teachers to students of Agriculture in higher institutions to enable them teach agriculture effectively in schools. Pedagogically, Agricultural Education covers courses in psychology of learning, curriculum, measurement and evaluation, methodology of teaching in addition to guidance and counseling while technically covering causes in animal production, tree crop production, genetics, soil fertility management and farm mechanization among others.

Ifeanyieze (2010) opined that Agricultural Education provides knowledge and understanding of food and fiber system. An individual possessing such knowledge would be able to synthesize analyze, and communicate basic information about agriculture. Basic agricultural information includes; the production of plant and animal products, the economic impact of agriculture, its societal significance, agricultural importance in relationship with natural resources and the environment; the marketing of agricultural products, the processing of agricultural products, the public agricultural policies, the global significance of agriculture and the distribution of agricultural products. Agricultural Education also provides its recipients with the knowledge and skills on how to produce food. Agricultural Education programme is important to the future of any nation and the discipline of agriculture (Ifeanyieze, 2010). Because the majority of the public is now almost completely removed from agriculture in their daily lives, it is of utmost importance that best practices in agricultural production are identified to ensure Agricultural Education is maintained in future generations. The methods used to present Agricultural Education to students can greatly influence students' attitudes towards learning materials (Okiror, *et al.*, 2011).

The Roles of Agricultural Education towards Sustainable food Security in Nigeria for Global Competitiveness

The issue of Agricultural Education for food security is concerned with the totality of well-being of mankind. The fact remains that the present youths at the various levels of our educational system are future farmers. Consequently, the interest and zeal manifested by the youths towards Agricultural Education are significantly related to the achievement of self-food sufficiency aspiration of the nation, now and in the future. Thus, the involvement of the head (thinking), heart (feelings) and hands (skills) in agriculture can and if properly channeled can promote a new era in Agricultural Education for food security in Nigeria (Egbule, 2004).

Food security is important to us as a nation, now than ever before. Food security can be defined as "access by all people at all times to enough food for an active and healthy life" (World Bank, 2023). This definition has two main elements: first, the availability of food, through production, storage or imports, and second, access of people to food by having the income to buy it or the financial and other resources to grow it.

Two aspects of food security can be identified: intra-generational food security, which is simply the ability of individuals and households most especially the rural dwellers and urban poor to meet their staple food needs all year round. The other is inter-generational food security which is the ability of future generation to meet their food needs on-season and off-season. Both aspects of food security imply development that meets the needs of the present generation without compromising the ability of future generations to meet their needs (World Bank, 2023). It therefore involves the management and conservation of the natural and human resources base, technological orientation and institutional changes that ensure the attainment and continued satisfaction of basic human food's needs, now and in the future.

Egbule (2004) noted that to achieve food security and join the rest of the world in science and technology, Nigeria as a nation must re-double her efforts at cultivating pockets of technology at all levels of education, particularly at the primary and secondary school levels. More attention is needed on practical and productive aspects of our education. Agricultural Education should be competency-based, skilled and production – oriented. In other words, Agricultural Education should be more removed from the confines of the classroom and laboratories into farms, gardens, markets, industries and rural communities. In this direction, the agricultural science curriculum at the primary, secondary and tertiary levels may need to be reviewed, and aimed at incorporating recurrent topics on ideals and discarding contents that are of marginal practical relevance. More emphasis should be laid on exploratory activities, individual and group projects, and on industrial work experience.

Egbule (2004) opined that the rate and level of development of any nation is dependent on her level of agricultural development. In other words, food security is important to any nation in dire need of development. This is because a nation that cannot meet the basic food needs (in terms of quantity and quality) of her populace is politically and economically unstable and could be easily maneuvered and threatened by more stable nations. Egbule (2004) noted further that his fear can most easily be overcome through the application of knowledge, skills, and attitudes acquired from Science and Technology into agricultural production. More so, the need for improvement in the state and condition of rural areas and its inhabitants is great. According to Egbule, (2004) this is where Agricultural Education should come in. Furthermore, Egbule, (2004) depicted that Agricultural Education can contribute towards the realization of sustainable food security and Global Competitiveness through:

a. providing young people with sound knowledge, skills and creative abilities with which they can translate into real agricultural production;
b. producing more trained personnel involved in extension services for translating research findings into field trials, adaptation and commercialization;
ii. providing training for specialist agricultural occupations such as plant and animal breeding, plant and animal pathology, food processing and preservation, agricultural financing and insurance and rural sociology.
iii. providing farmers with the knowledge and skills for efficiency in production decision – making process;
iv. equipping students and all agricultural practitioners with the knowledge and facts about Nigeria's agricultural potentials, technology and environment;
v. helping farmers and students appreciate positive values such as good feeding habits conservation of our natural resources, personal hygiene and maintenance of family life;
vi. preparing students for life – long learning in agriculture and related subjects as well as enable them have an intelligent understanding of the problems and opportunities in their communities and environments; and
vii. developing problem–solving and safety practices on students and other agricultural practitioners.

Concept and Importance of ICT in a Teaching Learning Situation

The acronym, ICT simply means Information and Communication Technology, this is a concept that cannot be left out in all human endeavours in contemporary times. ICT is a classification term. According to Brewster (2012) & Ijeh (2022), ICT is defined as "a broad field encompassing computers, communication equipment and services associated with them". ICT means "the use of all conceivable digital media in managing and processing information". According to Adesote & Fatoki (2013), ICT means: a term which is currently used to denote a wide range of service, application, and technologies, using various types of equipment and software often running over telecom networks. Information and Communication Technology (ICT) is "an electronic-based system of information transmission, reception, processing and retrieval" (Ihebereme, 2008). Ihebereme (2008) noted that ICT is "the whole range of facilities or technologies involved in information processing and electronic communication". However, ICT is basically the use of radio, television, video, computer, senior interface boxes, e-mail, satellite connections, internets, and all other softwares and electric materials employed by the teacher to facilitate transfer of skills and knowledge.

According to Kubacka (2015), ICT can be a useful tool for teachers in advancing 21st century learning. He also stated that the use of ICT for students' project and class work is an active teaching practice that promotes student's skills for lifelong success. Reiterating the importance of ICT in the education sector, Kubacka (2015) opined that it involves the application of digital equipment to all aspects of school administration, teaching and learning. In the views of Jacobson (2015), the digital world calls for change of mindsets about schooling, teaching, learning, assessment and engaged in teaching more than ever. He further maintained that new educational technologies give room for a collaborative teaching and learning experience. The realization of these benefits is dependent on the support that teachers need in making major shift in their practice. Rich professional learning opportunities that engage teachers in making the shift are needed through ICT training. Beyond training is the issue of availability adequacy and utilization of digital devices in schools. The call for efficient utilization of ICT.

Being aware of the significant role of ICT in our life, especially in the educational activities, (Agricultural Education not left out) authorities in the educational sector

should implement strategies to encourage the use of ICT in supporting the teaching learning process in the classroom. ICT is not just the bloom of the educational activities, but it is also the secondary option to improve the effective and meaningful educational process (Jacobson, 2015). Teaching and information cannot be separated; hence one can rightly say that the duty of a teacher is information tasking. Education unlocks the door for modernization but it is the teacher who holds the key to the door. In the same vein, if we say the child is the centre of educational system, the teacher then is the pivot on which the education process revolves. Hence the teacher needs to transform the classroom from a static one-way flow of information from teacher to student into a dynamic student-centered learning environment in which learners interact with peers in teaching both, in their own classroom as well as others through ICT (Ike-Obioha & Ikwuegbe, 2015).

Furthermore, Information and Communication Technology is the use of computing and telecommunication technologies, systems and tools to facilitate the way information is created, collected, processed, transmitted and stored (Rouse, 2023). According to UNESCO (2017) Information and Communication Technology (ICT) is a diverse set of technological tools and recourses used to transmit, store, create, share or exchange information. Accordingly, these technological tools and resources include Computers, the internet (websites blogs, and emails), live broadcasting technologies (radio, TV, and web casting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices) and telephony (fixed or mobile, satellite, visio/video-conferencing, etc).

Advantages of Using ICT in Classroom Lessons

ICT has advantages in the classroom teaching and learning processes, some of which are spelt out by Krishan, *et al.* (2019); Chatterjee (2021) and Telefonica Communication Team (2023) as follows:

1. **Get Higher Quality Output:** Example of ICT being used innovatively to create high quality output, such as student in using PowerPoint to create animated presentations showing the way seed germination occurs.
2. The Internet as a research tool is used by students to find their own information and concept to enhance their understanding of many aspects of the subject. The Internet is often used to augment textbooks at much lower cost; as well as research and gathering of ideas.
3. The use of digital technology allows students to learn faster much more than would be possible with traditional techniques given the amount of curriculum time available. ICT can be used effectively in science to show video sequences of things that are hard to explain or visualize.
4. Compared to the traditional method, ICT enables high quality output. ICT as a tool is used to increase the breadth and speed of learning, increasing the efficiency of both teacher and students. ICT was used to gather, analyze and present information and the teacher described her use as great for cutting down time where you want to analyze information.
5. With the aid of ICT, teachers plan and work collaboratively to integrate more subjects into their various field of study. The work done in all lessons is set in a context that encourages cross fertilization of skills across subjects.
6. **Planning the use of ICT:** ICT alone does not enhance learning. How ICT is incorporated into learning activities is what is important. Some teachers use ICT as a way of encouraging independent learning skills. However, this still needs to be planned and supervised with the teacher directing the learners' activities and output.
7. **Technical Reliability:** It is important to acknowledge that ICT can have technical problems and contingency planning is

necessary to ensure that alternative strategies are in place. As computers become more sophisticated and the range of software used by schools and colleges continues to increase, it must recognize the need to employ more and higher quality technical staff.

8. **Saves Time and Less Expensive:** Incorporating ICT across the curriculum requires careful timetabling and cooperation among departments. Generally, in science particularly, it may not be possible to move practical classes to ICT suites because of health and safety considerations or to site computer in science Laboratories because of space constraints. In other subjects, the times when the ICT suites are available may not suit the schemes of work planned by the teachers. Consequently, much more cross-curricular and departmental planning is required than most schools and colleges have been used to in the past.
9. **Changing Pedagogy:** Teachers have to accept that the widespread use of ICT in schools is having an impact on teaching pedagogy and require a significant rethinking of approach. Constructivist instruction assumes that understanding comes from relating new ideas to the learner's prior beliefs. Skill acquisition comes in an unstructured way as new skills are used as required to solve practical problems.

Importance of ICT to the Teachers

According to Ike-Obioha and Ikwuegbu (2015) and Chatterjee (2023) ICT are used by the teacher and students in the exchange of viable information and idea to enhance learning in the following ways:

1. ICT has the concept of multimedia which involves teaching and learning devices using the videos, CD Rom, Floppy dish etc.
2. ICT engages the students to make independent study and research even at home, thereby reducing the work load of the teacher and the constant use of the classroom facility.
3. It helps to promote distance learning. The teachers can adopt the electronic devices to impact knowledge into students even without physical contact.
4. Teachers and students can communicate to each other through the web, mail or internet.
5. Students can share their thoughts and views of others and create online data bases necessary for online challenging problems. This can be done through modeling, simulation and guided discovery,
6. It helps the teacher to create more learner centered environment than the traditional teacher centered method.
7. It makes learning more comprehensive, interesting and interactive thereby increasing motivation in learning. By collecting relevant information and data, ICT gives the teacher confidence in the presentation of his lessons as a professional.
8. It helps to expose the teacher to various research works and experiences which improve quality of teaching and learning.

Problems of ICT in Teacher Education

As every good thing has a bad side, in the same way ICT also has both positive as well as negative impact on education. But the use lies in our hands whether to use ICT in a useful manner or have its negative impact on our life. However, Habibu, *et al.* (2010) and Ike-Obioha and Ikwuegbe (2015) reported that the problems of ICT in education include, but not limited to the following:

1. There is dearth of qualified staff in ICT as well as infrastructural facilities that impedes the smooth usage of the technology.
2. The cost of most of the ICT gadgets especially software is highly prohibitive and with the present socio-economic background of teachers. The cost of computers is too high for many to afford. Monthly internet rates are exorbitant and the charges for satellite television are unaffordable by most people in Africa.

3. Most of the teachers are illiterates in the use of ICT and may not be interested adopting it.
4. Poor information infrastructure. It has been reported that more than 40 percent of the population of Africa is in areas not covered by telecommunication services. Schools located in such areas will experience ICT connectivity problem.
5. Lack of inadequate ICT facilities in schools in Nigeria. Electricity failure has been a persistent problem militating against ICT application and use in Nigeria. This makes the few schools with ICT facilities unable to use them regularly.
6. Poor ICT policy/project implementation strategy: The Federal Republic of Nigeria policy introduced computer education to high schools. The only policy implemented was the distribution of computers to federal government high schools which were never used for computer education of the students.
7. Inadequate ICT manpower in the schools: The main problem facing Nigeria and its ICT programme is workforce training. Teaching as a profession in Nigeria is considered to be for poor people; therefore, the few professionals that are available prefer to work in companies and industries where they can earn better salaries. With this deplorable condition, teachers are not motivated to go the extra mile in assisting the students to acquire computer education.
8. Lack of/poor perception of ICTs among teachers and administrators: There is a widespread ignorance and misconception about ICTs amongst Nigerians. One of the major inhibitors to Nigeria fully embracing ICTs is the average Nigerian's general lack of exposure to them. For most Nigerians, information technology is still something unfamiliar, distant, and mysterious. Rather than being seen as a tool for personal and national development, information technology is seen as a hurdle. E-schools project have no or very limited experience and expertise regarding ICTs in education.

Conclusion

Attempt has been made in this paper to analyze the meaning of Agricultural Education, need for Agricultural Education for sustainable food security, the roles of Agricultural Education towards sustainable food security in Nigeria for global competitiveness, concepts and importance of ICT in a teaching - learning situation, advantages of using ICT in class room lesson and the problems associated with ICT usage in schools.

However, it is the opinion of the authors that the role of ICT in agricultural production cannot be over emphasized, as it is seen as a pivot on which sustainable agricultural production revolves. Therefore, the stakeholders of the educational sector should make available to schools all the relevant ICT facilities, for the teaching and learning of Agriculture to be effective and meaningful which will subsequently lead to massive food production and thus guarantee food security in our Nation.

Recommendations

The following recommendations are made based on the above discussion:

1. Policy makers should make workable policy and implement same in Nigeria, as it affects ICT.
2. Emphasis should be placed more on ICT education, as against the educational system we are operating currently.
3. The government should pay more attention to the education sector with respect to ICT facilities in the departments, faculties and schools of Agriculture.
4. The government and all stakeholders should ensure that ICT is fully integrated into Agricultural Education for Sustainable Food Security in Nigeria, so as to attain Global Competitiveness.

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LECTURERS' USE AND CONSTRAINTS TO UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY FOR TEACHING AGRICULTURE IN UNIVERSITIES IN SOUTH-SOUTH NIGERIA

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Abstract
The purpose of this study was to assess lecturers' use and constraints to utilization of ICT in teaching Agriculture in universities in south-south Nigeria. The study adopted ex –post facto design using two research questions and two null hypotheses. The population of the study was 395 lecturers with a sample of 199 agriculture lecturers selected using the multi –stage sampling technique. Data were collected using a structured questionnaire designed on a 4-point scale. The data were analyzed using means and standard deviation for research questions and t-test for hypotheses. The result revealed that the ICT facilities utilized by lecturers were Computer, Overhead Projector, Internet, E-mail, and video conferencing among others while the constraints to effective utilization of ICT for teaching agriculture include epileptic power supply, poor internet infrastructures and inadequate funding among others. The study recommended among others that ICT facilities particularly for setting and marking examination questions and scripts, storage and preservation of Academic records for long period of time including students' academic records should be brought into the scheme as recommended by the Nigeria universities commission and that government should ensure the provision of steady and stable electricity since ICT application depends solely on steady regular power supply.

Keywords: Constraints, Utilization, ICT, Agriculture

Introduction

The use of information and communication Technology in teaching and learning is a relevant, innovative and functional way of providing education to learners that will assist in inculcating in them the required capacity for reversing the economic challenges that has bedeviled Nigeria. ICT have the potentials to accelerate, enrich and deepen skills, to motivate and engage students to help relate school experience to work practices (Aderson, 2013). ICT is a science of information that uses the computer and multi-electronic resources to collect, process, store, retrieve, and transmit or disseminate information to wherever in the world.

According to Ali and Mamum (2011) as cited by Ikeoji (2011), ICT is viewed as an instrument, a system flow, a means of instruction where online tutorials are done, a new platform, expert systems, and virtual space for studying various subjects. The need for ICT literate lecturers and their involvement in the utilization of ICT tools are a sine qua non for effective teaching. Jamieson-Procter (2013) reported that ICT can be comfortably used in instructional delivery if properly utilized by lecturers who plan and guide the lectures. The effective utilization of ICT in our universities in the teaching and learning of Agriculture as a discipline will make teaching no doubt more rewarding and enticing.

However, according to Okolije (2016), accessibility in ICT refers to the capacity of instructors and students to own or rent ICT resources and utilize the ICT services that are offered. The ability for everyone to access, use, and benefit from items in their environment—regardless of disability or special needs—is known as accessibility. ICT integration into the university system alone is insufficient if it is not properly implemented to provide high-quality instruction (Kpolovie & Iderima, 2013). According to Onoanya, *et al.* (2010), the following qualities should be possessed

by instructors possess when utilizing ICT in the classroom: Competent in using ICT on a personal level; proficient in a variety of educational models that use ICT as a delivery method, proficient in utilizing ICT for instruction and teaching, proficient in a variety of ICT-based assessment models, proficient in comprehending the policy aspects of ICT utilized for teaching, instruction, and learning.

According to Onasanya, *et al.* (2010), there are three main ways that ICT can be used in education. These three are information science, technology as a tool, and IT-assisted learning. In a similar vein, Onasanya, *et al.* (2010) referenced the Association of African Universities, which listed the following ICT applications for teaching and learning: To impart fundamental computing skills, to provide fundamental computer literacy abilities relevant to certain academic fields, to establish access to secluded sources, to improve communication abilities, to provide content (such as online work tools) for assignments. - To create course management systems (for both traditional classroom instruction and remote learning), to work together with instructors and students from around the world to conduct online teaching and learning.

Nikkokopoulou and Gialamas (2016) stated lack of technological resources as the major obstacle to ICT utilization in the classroom. The availability and functionality of ICTs continue to determine how they are used in education. The term "ICT utilization" refers to the dissemination and display of educational materials through electronic devices (also known as "e-teaching") in order to facilitate communication and learning (Yusuf, 2011). The availability of ICT resources is important, but so is their functioning and the lecturers' ability to use them to improve the teaching and learning of agricultural science courses. Therefore, improved methods by which lecturers plan and deliver learning experiences and use resources in line with international best practices are referred to as enhanced instructional delivery. Some instructors barely ever used computers or other ICT resources when delivering lessons since these resources were either non-existent or nonfunctional and/or their instructors lacked enough training on how to use them. According to Adedeji (2011), the majority of institutions would prefer to use the ICTs that are available for administrative tasks rather than for the main goal of supporting teaching and learning. There are a lot of things that could make using ICT in the classroom setting difficult. Samuel and Baker (2006), for example, reported that learning management systems, central databases, inconsistent power supplies, restricted computer facilities for lecturers, and no internet were accessible for electronic learning in institutions. Samuel and Baker (2006) also drew attention to the lack of capacity-building and training for lecturers, who should have received enough instruction on how to use these resources when they were made available.

In spite of the immense benefits derivable from the use of modern information and communication devices, as enumerated above, a number of challenges still militate against their use in improving the teaching and learning process generally in Nigerian universities. Some of these challenges include cost, funding, poor electricity supply, the problem of training and re-training, and sabotage (Ikeoji, 2011). Oluyomi (2010), as cited by Akpomedaye (2011), identified poor access, poor connectivity, and poor knowledge of ICT as problems of ICT acquisition and utilization in universities.

The Organization for Economic Co-operation and Development (2015) emphasized that financing is a significant obstacle to utilizing ICT and this prevents the purchase and application of ICT facilities in Nigerian university education. The majority of institutions only get funding from their owners, and the majority of those funds are used to cover overhead. Because there is now no clear, workable business model for the commercial supply of e-learning and there have been more failures than successes, institutions are reluctant to spend the meagre funds at their disposal on e-learning initiatives.

According to Onasanya, *et al.* (2010) and the Association of African Universities, there are several constraints to the adoption and use of ICTs in African universities. In line with Conwart (2001) and Drummond, Sheperis, and Jones (2016), they include: lack of a National Information and Communication Infrastructure Policy (NICI), Internet traffic, congestion, or saturation due to inadequate bandwidth, non-reliability of electricity power, exorbitant costs for internet service providers (ISPs), inadequate and erratic funding for IT projects, a poorly developed national telecommunications infrastructure, with a special emphasis on poor telephone access, a highly regulated telecommunications industry, subpar internet service provider performance, and a lack of incentives to encourage innovation and taking calculated risks—the absence of an enabling environment, in certain nations, chances for foreign cooperation and support are thwarted by a hostile social environment and possible instability, the unreliability of the electrical supply, the high expense of importing ICT equipment, which is frequently made worse by national tariff levels, internal organization constraints and constraints pertaining to human resources are among the others.

The major barriers that prevent lecturers from adopting and using technologies in their classroom are a lack of lecturers ICT knowledge, skills, and competence in using them, a shortage of technical resources, insufficient technical and administrative support, and inadequate training opportunities. (Lawrence & Tar, 2018; Nikolopoulou & Gialamas, 2015; Razak, *et al.*, 2018; Vitanova, *et al.*, 2015). Furthermore, Ros (2001) opined that constraints in using ICT are the first-order (or extrinsic) institutional, which involve factors such as a lack of access to ICTs, a lack of time to incorporate ICT in teaching, and a lack of technical support in schools, and the second-order (or intrinsic, personal) involve beliefs about using ICTs in teaching, commitment to maintaining established practices, and willingness to change the teaching approach (Mouza, 2013; Azarfam, 2012; Civiko, 2012).

Mirinda (2012), also identified constraints to using ICT, which involve the utilization and application of ICTs to design classroom curricula. Tsai (2012) also stated that "time demands, the material background of the schools, a lack of support from school management and colleagues, a lack of knowledge and skills, subjectively perceived unsuitability of using ICTs for the subject taught, distrust of new procedures and technologies, and a lack of motivation hinder lecturers from using ICT in delivery instruction".

Etonyeaku (2010), in line with Aneke (2015), observed that most of the lecturers are not ICT-compliant and prefer to use conventional methods of teaching. Agbulu and Ademu (2010) stipulated that ICT poses a lot of challenges to agricultural education lecturers, which include funding, procuring and repairing broken-down ICT facilities, the creation of content and stock of programmes to be used, and a change in the nature of lecturers' authority. Numerous obstacles, according to Ilaoni and Osuagwu (2010), restrict the use of ICT in Nigerian educational institutions. These include the lack of ICT infrastructure and access, high enrollment rates, insufficient funding and non-allocation of funds to technology, high ownership and consumer costs, and policy ramifications of the mismatch between ICT technology's advertised capabilities and specific institutions' goals.

Also, Sam (2011) identified the following as constraints to the use of ICT, paucity infrastructure and lack of access, high cost of the End- user, high cost of ownership, unsteady and inadequate electricity power supply.

Another issue that hinders any nation's progress is brain drain. Due to brain drain, there isn't the necessary number of ICT scientists and engineers to carry out ICT-related projects on a professional basis. The absence of a strong ICT plan and policies by policymakers, which leads to disorganized and unsustainable ICT development efforts, is another significant barrier. Additional

issues mentioned by Instiful, *et al.* (2003) are as follows: exorbitant operating and membership fees, insufficient advertising and incentives to draw in new users, finding information sources that satisfy user needs, low internet and telecommunications service quality, Skillful network traffic and infrastructure management. This study therefore focuses on lecturers' use and constraints to utilization of information and communication Technology for teaching Agriculture in universities in South- South Nigeria is emphasized in the study.

Purpose of the Study

The main purpose of this study was to assess lecturers' use and constraints to utilization of ICT for teaching agriculture in universities in South-South Nigeria. Specifically, the study sought to:

i. ascertain the extent of utilization of ICT by Agriculture lecturers for teaching Agriculture in universities in South-South Nigeria; and
ii. determine the constraints to effective utilization of ICT by Agriculture lecturers for teaching Agriculture in universities in South-South Nigeria.

Research Questions

The following research questions guided the study:

1. What is the extent of utilization of ICT by Agriculture lecturers for teaching Agriculture in universities in South-South Nigeria?
2. What are the constraints to effective utilization of ICT by Agriculture lecturers for teaching Agriculture in universities in South- South Nigeria?

Hypotheses

The following hypotheses were tested in the study:

1. There is no significant difference between the mean responses of male and female Agriculture lecturers on the level of utilization of ICT by Agriculture lecturers for teaching agriculture in universities in South- South Nigeria.
2. There is no significant difference between the mean responses of male and female Agriculture lecturers on the constraints to the utilization of ICT by Agriculture lecturers for teaching agriculture in universities in South- South Nigeria.

Methodology

The study adopted ex-post facto design. The population of the study was 395 lecturers in the five States in South- South geopolitical zone. This is made up of lecturers from Faculties of Agriculture and Agricultural Education from different universities. Multistage sampling techniques was used to sample 199 lecturers from various universities under study. The instrument used for data collection was a structured questionnaire. The questionnaire was constructed using the 4- point rating scale of strongly Agree (SA) Agree (A)Disagree (D)and Strongly Disagree (SD) with corresponding values of 4, 3, 2, and 1respectively and Very High Extent (VHE), High Extent (HE), Low Extent (LE) and very Low Extent (VLE) with corresponding value of 4, 3, 2 and 1 respectively. The instrument was subjected to face validation by three experts, one from Department of Agricultural Education, one from Faculty of Agriculture and one from Measurement and Evaluation all from Delta State University, Abraka. The validated instrument was administered to Agriculture lecturers.

The result of reliability instrument was analyzed using Cronbach alpha method. A mean reliability coefficient above 0.70 was obtained which was reliable and adequate for the study. The data gathered were analyzed using mean and standard deviation for research questions and hypotheses were tested using t-test. The decision rule for the research questions was based on the mean value of ≥ 2.5 as agree and ≤ 2.5 as disagree of each item remarks.

Results

Research Question 1

What is the Extent of Utilization of ICT by Agriculture Lecturers for teaching

Agriculture in universities in South- South in Nigeria?

Hypothesis 1

There is no significant difference between the responses of male and female Agriculture lecturers on the level of utilization of ICT by Agriculture lecturers for teaching Agriculture in universities in South- South Nigeria.

Table 1

Mean and standard Deviation of the Responses of Male and Female Agriculture Lecturers on the Level of Utilization of ICT by Agriculture Lecturers for teaching Agriculture in Universities South- South Nigeria (n=185)

S/N	Items	$\bar{x}_1$	SD1	$\bar{x}_2$	SD2	Df	t	p	Decision
1.	Computer	3.41	0.56	3.51	0.55	183	0.96	0.27	NS
2.	Overhead projectors	3.26	0.69	3.20	0.61	183	0.48	0.63	NS
3.	Television	1.96	0.81	1.80	0.74	183	1.22	0.23	NS
4.	Radio	1.75	0.81	1.88	0.86	183	-0.94	0.35	NS
5.	Fax machine	1.89	0.76	1.78	0.82	183	0.89	0.38	NS
6.	Desktop	3.26	0.63	3.16	0.59	183	0.91	0.37	NS
7.	Internet	3.49	0.57	3.41	0.61	183	0.80	0.43	NS
8.	Electronic notice board	2.09	0.85	2.14	0.91	183	-0.38	0.71	NS
9	Digital multimedia	2.08	0.84	2.20	0.79	183	-0.89	0.37	NS
10.	Video/VCD machine	2.19	0.87	2.18	0.88	183	0.05	0.96	NS
11.	Zoom	2.56	1.07	2.51	1.12	183	0.27	0.79	NS
12.	Skype	2.18	0.86	2.10	0.85	183	0.57	0.57	NS
13.	E-mail (electronic mail)	3.44	0.56	3.49	0.55	183	-0.53	0.60	NS
14.	Video conferencing media	3.01	0.76	2.96	0.79	183	0.38	0.71	NS
15.	Scanner	2.90	0.77	2.98	0.78	183	-0.64	0.52	NS
16.	Photocopies	3.42	0.52	3.31	0.55	183	1.28	0.20	NS
17.	Printers	3.34	0.49	3.33	0.56	183	0.14	0.89	NS
18.	Google classroom	2.18	0.79	2.04	0.84	183	1.07	0.29	NS
19.	Webinar technologies	2.13	0.93	2.12	0.90	183	0.07	0.94	NS

Significant Level = ($p > 0.05$)

Key: $\bar{x}_1$ = Mean of male; SD1 = Standard deviation of male; $\bar{x}_2$ = Mean of female; SD2 = Standard deviation of female; df = degree of freedom; t = calculated value of t; p = table value; S = Significant; NS = Not Significant

Source: Field Survey (2023)

The findings in Table 1 shows that items 1,2,6,7,11,13,14,15,16, and 17 are utilized for teaching by both male and female lecturers as their cut-off point is above 2.50. This indicated that the 10 identified items are utilized by Agriculture lecturers in their teaching. However, items 3,4,5,8,9,10,12,18 and 19 are not being utilized by lecturers in their lesson delivery as their cut-off point is below 2.50. The standard deviation for male and female respondents ranges from 0.49 to 0.77 and 0.55 to 0.79 respectively, indicating that, the respondents were not far from the opinions of one another in their responses. The result on the hypothesis shows that the p-value is greater than the alpha value of 0.05 (5%) level of significance. Hence the null hypothesis was upheld signifying that there is no significant difference between the responses of male and female Agriculture lecturers on the level of utilization of ICT by Agriculture lecturers for teaching Agriculture in universities in South-South Nigeria.

Research Question 2

What are the constraints to effective utilization of ICT by Agriculture lecturers for

teaching Agriculture in universities in South-South Nigeria?

Hypothesis 2
There is no Significant difference between the mean responses of male and female Agriculture lecturers on the constraints to utilization of ICT by Agriculture lecturers for teaching Agriculture in universities in South-South Nigeria.

Table 2
Mean and Standard Deviation of the Responses of Male and Female Agriculture Lecturers on the Constraints to Utilization of ICT by Agriculture Lecturers for teaching Agriculture in Universities in South- South Nigeria (n=185)

S/N	Items	$\bar{x}_1$	SD1	$\bar{x}_2$	SD2	Df	t	p	Decision
20.	Epileptic power supply	3.68	0.47	3.78	0.42	183	-1.30	0.20	NS
21.	Poor internet infrastructure – manpower	3.48	0.50	3.39	0.53	183	1.06	0.29	NS
22.	Inadequate funding	3.58	0.51	3.41	0.57	183	1.97	0.05	NS
23.	Internet traffic congestions	3.36	0.50	3.39	0.49	183	-0.33	0.74	NS
24.	High internet service providers fees	3.59	0.49	3.57	0.58	183	0.20	0.85	NS
25.	Poor National Telecommunication Infrastructures	3.42	0.50	3.27	0.49	183	1.87	0.06	NS
26.	Insufficient Skills for Managing Teaching Materials	3.13	0.73	3.27	0.70	183	-1.11	0.27	NS
27.	Lack of In-service Training on the Use of ICT Facilities	3.52	0.50	3.43	0.50	183	1.12	0.26	NS
28.	Limited Knowledge - Experience of ICT Support in Teaching Context	3.28	0.64	3.20	0.61	183	0.71	0.48	NS
29.	Lack of Motivation and Technical and Financial Support	3.37	0.48	3.27	0.53	183	1.24	0.22	NS

Significant Level = ($p > 0.05$)

Key: $\bar{x}_1$ = Mean of male; SD1 = Standard deviation of male; $\bar{x}_2$ = Mean of female; SD2 = Standard deviation of female; df = degree of freedom; t = calculated value of t; p = table value; S = Significant; NS = Not Significant
Source: Field Survey (2023)

Table 2 revealed the mean ($\bar{x}$) and standard deviation (SD) values of the constraints to effective utilization of ICT by agriculture lecturers for teaching agriculture. The results shows that items 20 to 29 had mean scores ranges from 3.13 to 3.68 for male while that of female is between 3.20 to 3.78 which is more than the cut-off point indicating that the 10 items were constraints to effective utilization of ICT by Agriculture lecturers. Also, the standard deviation of the responses from respondents on the 10 items for male and that of female ranges from 0.42 to 0.70, meaning, the respondents were not far from the mean and from the opinions of one another. However, the data on the hypothesis shows that the p-value is greater than the alpha value of 0.05 (5%) level of significance hence the null hypothesis was accepted. Therefore, there is no significant difference between the Mean value of the responses of male and female Agriculture lecturers on the constraints to utilization of ICT by Agriculture lecturers for teaching Agriculture.

Discussion of Findings

Table 1 identified 10 items that are being utilized by lecturers in their lesson delivery. The findings are in line with Ololube, *et al.* (2015) who says that the use of ICT in Education have positive impact on teaching and learning. Also, the table identified 9 items not utilized by lecturers in their lesson delivery and the findings agree with Merrian (2019) who stated that due to inadequate knowledge of how to utilize these ICT tools and the unavailability or malfunction of the existing ICT facilities, several lecturers barely used ICT facilities when delivering instruction. A further dissection of this aspect of the study, particularly the variety of ICT gadgets and hardware utilized in teaching by Agriculture Lectures shows that it is still evolving. For instance, the study reveals the acceptance of the following: computers, overhead projectors, desktop, internet, e-mail, video conferencing, media, scanners, photocopiers, printers. But the question as to the degree of utilization can only be positively determined by the fact that of all these facilities only gadgets such as e-mail, computer, photocopiers and printers used in printing out and duplicating documents enjoy massive and complete utilization in contrast to cyclostyling machines and type writers which they succeeded. Facilities such as Desktop publishing and Video Conferencing Media, Overhead Projectors enjoy utilization to the extent that the relevant manpower with the technical know-how to set up and man the operations thereto are available. Where there is non-availability of these technical personnel, most of the hardware lie in the offices as monuments and are hardly utilized. Correlative to the above assertion is also that necessary manpower with technical know-how to maintain, upgrade, service and repair the ICT facilities when they break down or need servicing is scarcely available. These impact negatively on the degree of the deployment of these gadgets or their utilization.

Likewise, devices such as Television, Radio, Electronic Notice board, Zoom, Skype and Webinar technologies might not be in vast deployment notwithstanding the availability of competent manpower for their operations, repair and maintenance because these are mainly gadgets for mass dissemination of information and are not suitable for internal or short distance teaching and learning. Teaching within the area covered by the research study and indeed Nigeria in general is usually classroom based. Therefore, it is only ICT facilities which are relevant in compact or short distance environments that can be extensively deployed. Given these scenarios, it is the gadgets in the first category can only be extensively deployed, in the context of inter campus or inter university collaboration. Another example applies to WEBINAR technologies and Zoom facilities which by their design and operations are mostly suitable for VIRTUAL or DISTANCE learning programs. In the South – South geopolitical zone of Nigeria nay Nigeria at large learning is by interactions between the lecturers and students. Indeed, in certain cases particularly with respect to Agriculture, physical attendance and participation by the students is indispensable such that a minimum standard in terms of participation and or attendance is prescribed which the student must attain and satisfy before graduating. Therefore, some of the facilities are actually unsuitable going by the university curriculum in Nigeria

Table 2 items were identified as constraints to effective utilization of ICT by Agricultural lecturers. The following are constraints to effective usage of ICT, epileptic power supply, poor internet, ICT infrastructure, inadequate funding, internet traffic congestion, high internet service providers fees, poor national telecommunication infrastructure, insufficient skills for managing teaching materials, lack of in-service training on the use of ict facilities, limited knowledge-experience of ICT support in teaching context, and lack of motivation and technical and financial support.

The findings are in agreement with the one by Drummon, *et al.* (2016) which stated that internet traffic congestion, non-reliability of electricity power, high cost of internet service provider, irregular and inadequate funding of ICT initiative, Poor national telecommunication infrastructure are constraints to effective utilization of ICT facilities by lecturers. The findings also correspond with that of Lawrence and Tar's (2018) which revealed that the major constraint that prevent lecturers from adopting and using technologies in their classroom are lack of ICT knowledge, skills and their competence in using it, shortage of technical resources, insufficient technical and administrative supports and inadequate training opportunities. A careful appraisal of this segment would reveal that this is an issue which in the strictest terms does not only relate to the subject matter of this study, but cuts across every facet of the national ethos. So a discussion of the constraints to effective utilization of ICT facility as a matter of reality have bearing on the wider national perspectives; thus the outcome is not surprising at all, for instance factors such as Epileptic Power supply being the highest and most pervasive factors are not limited to teaching of Agriculture but it is the highest common factor impeding the development of other aspects of the economy such as: Health and Education facilities in generals; industrial development etc. The next factor is High Internet Provider Fees which is mainly influenced by poor communications infrastructure development and low base of the industrial and technological development. The resultant effect is that most ICT hardware are sourced from abroad with the attendant high cost of purchase, inadequate funding and absence of In-service training on the usage of ICT facilities stem from the same melee which has to do with paucity of funds to the work load of Nigeria universities. Universities in the South-South geopolitical zone are only but a fraction of the institutions of higher learning across the length and breadth of the nation. So is a common challenge at the door steps of either federal or state governments and their agencies, ministries and departments in charge of tertiary education in general and Agriculture in particular. Lack and absence of In-Service Training and poor internet manpower infrastructure development also cut across all the facets of the national development, but can be redressed by the universities as primary beneficiaries within the context of resources available. As citadels for high level manpower development and training, problems of Lack of in-service training and poor ICT manpower development is within their statutory functions which can be addressed through exchange programs, collaborative efforts and training and developmental schemes with sister universities in advanced countries where ICT facilities are readily available. The above also applies and can easily redress other factors such as lack of knowledge or limited knowledge i.e. experience of ICT support in teaching context and Lack of Motivation and Technical and Financial Support. Table 2 revealed that there was no significant difference between the mean response of male and female Agriculture lecturers on the constraints to utilization of ICT by Agriculture lecturers for teaching.

Conclusion

Ten (10) items were rated by agriculture lecturers as ICT facilities that were utilized such as computer, overhead projectors, desktop, internet, zoom E-mail and video and video conferencing while nine (9) items were rated not utilized such as Television, Radio, Fax machine, electronic notice board and digital multimedia. Ten (10) items were agreed by Agriculture lecturers as constraints to effective utilization of ICT for lesson delivery amongst which are epileptic power supply, poor internet infrastructures and inadequate funding. The utilization of ICT tools is in dispensable for teaching, instructing and learning. The acquisition of necessary ICT skills will bring about much improvement in the attainment of instruction, teaching and learning goals.

Recommendations

1. It is suggested that ICT facilities particularly for setting and marking examination questions and scripts, storage and preservation of Academic records for long period of time including students' academic records should be adequately deployed for instruction.
2. Government should ensure the provision of steady and stable electricity since ICT application depend largely on steady regular power supply. Further issues of training of lecturers to master the facilities must be accorded a priority. Finally periodic and regular upgrade of facilities must be accorded a priority to ensure that equipment do not become obsolete.

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