

## ECONOMIC ANALYSIS OF YAM PRODUCTION IN OHAUKWU LOCAL GOVERNMENT AREA OF EBONYI STATE, NIGERIA

<sup>1</sup>OMOGO, EUCHARIA E., <sup>2\*</sup>ESHEYA, SAMUEL E., <sup>1</sup>GIBSON N. UMEH

<sup>1</sup>Department of Agricultural Economics, Management and Extension, Ebonyi State University, Abakaliki.

<sup>2\*</sup>Department of Agricultural Economics and Extension, National Open University of Nigeria, Kaduna Campus.

\*Corresponding Author E-mail: [sesheya@noun.edu.ng](mailto:sesheya@noun.edu.ng)

### ABSTRACT

*The study was economic analysis of yam production in Ohaukwu Local Government Area of Ebonyi State, Nigeria. This study employed multistage sampling technique in selection of respondents for the study. Primary data was collected from 160 respondents using a structured questionnaire. Analytical techniques such as descriptive and inferential statistics were used to analyse the specific objectives. Majority (70%) of the yam farmers were males, with mean age of 46 years. Majority (62%) of the yam farmers were married; had average farm income of ₦136,812.50 per annum and operated on an average farm size of 1.45 hectares. Another result revealed that water yam (90%), yellow yam (70%), and white yam (100%) were the major varieties of yams produced. Furthermore, net income of ₦47,910/ha was realized. Similarly, result revealed a gross margin of ₦94,090 with revenue of ₦142,000 per hectare of farmland. The return on investment estimated was 0.51 giving ₦0.51k gain. This study had shown that yam production is profitable although the farmers were hindered by infrastructural, institutional and economic factors. However, exogenous supports such as provision of credit facility and timely supply of farm inputs to farmers would enhance the production of yams among the farming households in the study area.*

**KEY WORDS:** Economic, Analysis, Yam, Production, Ohaukwu

### INTRODUCTION

The agricultural sector employs approximately two thirds of the country's total labour force and provides a livelihood for about 90% of the rural population. It is a key factor that can affect majority of Nigerians since over 60% of its population is involved in farming (Adamu & Esheya, 2022). It involves small scale farmers scattered over wide expanse of land area, with small holding ranging from 0.5 to 3.0 hectare per farm land. It is characterized by rudimentary farm systems with low capitalization and low yield per hectare (Mbah, 2010). Yam is one of the most frequently consumed staple food for most households in Nigeria. It is an important tuber crop of the tropics and some other countries. Yam belongs to the genus "*Dioscorea*" and family "*Dioscoreaceae*". It is an important tuber crop of the tropics and some other countries in East Asia, South America and India (Iwueke, Mbata and Okereke 2013). Yam is

scientifically known as *Dioscorea spp* and it is among the oldest recorded food crops and ranked second after cassava in the study of carbohydrates in West Africa (Agwu and Alu, 2015). There are over 600 species of yam worldwide but six species were considered as the edible ones in the tropics. These include; white yam (*Dioscorea rotundata*), yellow yam (*D. cayenensis*), water yam (*D. alata*), trifoliate yam (*D. dumentorum*), aerial yam (*D. bulbifera*) and Chinese yam (*D. esculenta*). Yam tubers are eaten boiled, roasted, fried and pounded and could be chipped, dried and produced into yam flour. Yam is one of the major staple food in Nigeria and has potential for livestock feed and industrial starch production (Ayanwuyi, Akinboye and Oyetoro 2011). It is on this point that, Bemire and Amujoygbe, (2015) noted that yam is one of the principal tuber crops in the Nigeria economy, in terms of land under cultivation and in the volume and value of production.

In Nigeria, yam is part of the religious heritage of several tribes and often plays a key role in religious ceremony (Odigbo, Ogbidi, & Ewa, 2015). Worthy of note is the fact that many important cultural values are attached to yam, especially during wedding and other social ceremonies. In many farming communities in Nigeria and other West African countries, the size of the yam enterprise that one has is a reflection of the person's social stature. Though, due to the importance attached to yam many communities celebrate the new yam festival annually (Ebewore, Egbodion, & Oboh, 2013). Traditionally, yam is a prestige crop that is viewed and received with high respect, prominently during special gatherings such as new yam festivals in rural communities of eastern, central and some parts of south west of Nigeria. In the humid tropical countries of West Africa, yams are one of the most highly regarded food products and are closely integrated into the social, cultural, economic and religious aspects of life. The ritual, ceremony and superstition often surrounding yam cultivation and utilization in West Africa is a strong indication of the antiquity of use of this crop. Thus, Nigeria being the world's largest yam producer, considers it to be a "man's property" and traditional ceremonies still accompany yam production indicating the high status given to the plant (FAO, 2008).

Yam production is regarded as a source of food security and employer of labour in many areas where it is cultivated. However, partly due to the lack

of farm inputs, finance, and high rate of poverty, limited added value and the loss of soil fertility in the areas, total annual yam output has not been increasing as expected. Despite the importance of yam as a pillar of food security, income and employment generation, its production has not been given the utmost attention and contribution of yam production to rural development is still questionable (Verter and Bečvařova, 2014). Some researchers have empirically investigated factors that determine the level of yam production in Nigeria and elsewhere in the world. For instance, Bamire and Amujoyegbe (2005) find a positive relationship between net returns (profitability) in yams output and land improvement techniques in Nigeria. In the same direction, studies by Zaknayiba and Tanko (2013) revealed that lack of access to inputs, finance, poor producer prices, inadequate of storage facilities, incidences of pests and diseases have negatively affected yam production.

In spite of the several studies on yam production, there seems to be no study on economic analysis of yam production in Ohaukwu Local Government Area of Ebonyi State, Nigeria to the best of knowledge of the researchers and thus, the study. The broad objective of this study is to conduct economic analysis of yam production in Ohaukwu Local Government Area of Ebonyi State, Nigeria. The specific objectives of the study were to: describe the socio-economic characteristics of the respondents in the study area; identify the various varieties of yam produced by farmers in the study area; and determine cost and returns of yam production in the study area. Based on specific objective of the study, the following hypothesis of the study was tested:  $H_0$ : There is no significant difference between cost and returns of yam production in the area. It is expected that this research work will serve as a guide to farmers currently engaged in yam production to determine the actual level of their profitability, performance and its contribution to household income and development.

## METHODOLOGY

### Study Area

This research was conducted in Ohaukwu Local Government Area of Ebonyi State. It is located geographically between latitude 0.06 North and longitude 0.85 degree with its headquarters located at Ezzamgbo along Enugu-Abakaliki expressway. It is bounded in the North by Benue State, in the South by Ezza-North Local Government Area, in the east by Ebonyi Local Government Area whereas it has common boundary with Ishielu Local Government Area in the West. NPC (2006) reported that Ohaukwu L.G.A has a population of about 196,337 and a land area of about 5068.9km<sup>2</sup>. The area has 3 major clans (town) namely; the Ngbo, Izhia (Ezzangbo), and Effium. The 3 clans constitute the 14 communities which include; Ukwuagba, Ekwashi, Okposi-eshi, Okposi-eheku, Umuogudu-oshia, Umuogudu-akpu,

Umuezeaka, Amoffia, Umuebe, Amike, Amaechi, Umuegara, Effium and Ntsulakpa (Esheya, 2019).

Rainfall in the area ranges between 1,500mm - 2000mm per annum while the temperature range is between 22.9°C to 32.5°C. Furthermore, it has a lowland forest with tall trees which are predominantly palm trees (*Elaiasguineensis*). The soil type is composed of well - drained sandy-loam soil and some scattered swampy fields. The predominant climatic seasons in this area are; rainy and dry season which run from June - October and November - March respectively. The soil of the area is clay-loam which supports to a large extent the production of cassava. This made cassava the most predominant crop in the area (Esheya, 2012). Another important crop that is predominant in this area is rice due to the swampy nature of some parts in the area. Other crops in the area include; yam, melon, maize, cocoyam, okra and pumpkin, etc. (Esheya, 2021).

### Sampling Techniques and Data Collection

This study employed multistage sampling technique in selection of respondents for the study. The selection was done in three (3) stages. Stage 1: This involved random selection of eight (8) communities out of 14 communities in the area. Stage 2: This involved a randomized selection of two (2) villages from each of the selected communities giving a total of sixteen (16) villages for the study. Stage 3: This involved a randomized selection of ten (10) yam farmers from each of the selected villages to make a total of one hundred and sixty (160) yam farmers who formed the respondents for the study. This sampled respondents were drawn from the ADP list of yam farmers in Ohaukwu LGA of Ebonyi State. Primary data were collected from 160 respondents in the study area using a structured questionnaire that was administered as interview schedule.

### Analytical Techniques

Analytical techniques such as descriptive and inferential statistics were used for this study. Descriptive statistics such as averages, percentages and frequency count were used to achieve objectives (i) and (ii) while objective (iii) was achieved with gross margin analysis. **Model Specification:**

#### i. Gross Margin Analysis

The formula for Gross Margin analysis is expressed as:

$$GM = TR - TVC \dots \dots \dots (1)$$

Where;

$$\begin{aligned} GM &= \text{Gross Margin (₦/ha)} \\ TR &= \text{Total Revenue (₦/ha)} \\ TVC &= \text{Total Variable Cost (₦/ha)} \end{aligned}$$

The Net profit is given as:

$$\pi = GM - TFC$$

Where;  $\pi$  = Profit

$$\begin{aligned} GM &= \text{Gross Margin} \\ TFC &= \text{Total Fixed Cost} \end{aligned}$$

#### ii. Test of Hypothesis

The null hypothesis which stated that: **H<sub>01</sub>**: There is no significant difference between cost and returns of yam production in the area was tested using F-test at 5% level of significance. The formula for calculating F-cal is shown below:

$$F\text{-cal} = \frac{R^2(N-K)}{1-R^2(K-1)} \text{----- (2)}$$

Where,  
 R<sup>2</sup>= Coefficient of Multiple Determination  
 N = Sample size  
 K= Number of variables or parameters

**Decision Rule:** if the F-cal> F-tab, reject the null hypothesis otherwise accept.

**RESULTS AND DISCUSSION**

**Socio-Economic Characteristics of the yam farmers in the study area.**

The socio-economic characteristics of the cassava farmers considered were: sex, age, marital status, household size, educational level, occupation, farm size, farming experience, annual farm income, membership of cooperative society and access to extension agents. The result of the socio-economic characteristics of the yam farmers was presented in Table 1.

**Table 1: Socioeconomic Characteristics of the Yam Farmers in the Area**

Socio-economic variables	Category	Frequency (N=160)	Percentage (%)	Mean (X)
<b>Sex</b>	Male	112	70.0	
	Female	48	30.0	
<b>Age</b>	≤30	48	30.6	
	31-40	38	23.7	
	41-50	36	22.5	46
	51-60	25	15.6	
	Above 60	12	7.5	
<b>Marital status</b>	Single	20	12.5	
	Married	100	62.0	
	Widow/Widower	40	25.0	
<b>Household size</b>	≤ 5	32	20	
	6-10	96	60	8
	Above 10	32	20	
<b>Education level (years)</b>	Primary Education (1-6)	108	67.5	8
	Secondary Education (7—12)	16	10.0	
	Tertiary Education (13-18)	36	22.5	
<b>Other Activities Engaged in</b>	Trading	58	36.2	
	Civil Service	63	39.4	
	Artisans	39	24.4	
<b>Yam Production Experience</b>	≤ 5	60	37.6	14
	6-10	20	5.7	
	11-15	12	7.6	
	15-20	25	15.6	
	21-30	34	21.2	
<b>Farm size</b>	Above 30	9	5.6	
	≤ 1	80	50.0	
	1-2	64	40	1.45
<b>Annual Farm Income</b>	Above 2	18	10.0	
	≤ 90000	16	10.0	
	₦100000 - ₦120000	64	40	₦136,818.50
	₦120001 - ₦160000	55	34.4	
	Above ₦160,000	25	15.6	
<b>Contact with Extension Agents</b>		48	30.0	
<b>Access to Extension Agent</b>		48	30.0	

Source: Field Survey, 2022

The result of the findings presented in Table 1, shows that most (70%) of the yam farmers were males, while

30 % were females. This showed that men were more involved in the yam production than woman in the

study area. This also shows that yam production in the area is dominated by men since the head of the household is the primary decision maker and men have more access to and control over vital production resources than women due to socio-cultural values and norms (Passam, Read, & Rickard, (2018); Sahore, Nemlin, & Kamenan, (2007); Serge, & Agbor-Egbe, (2016). Again, Splittstoesser, and Rhodes, (2013); and Twumasi, (2016) made similar observations. They both reported that men are major decision makers when it comes to such issues like adoption of new technologies and participation in an agricultural development programmes.

The age of most of the farmers (41%) ranged between 41-50 years while the least 7.5% aged above 60years. About 11% were less than or equal to 30years, while 23.7% and 15.6% were between 31-40 years and 51-60 years respectively. The mean age of the yam farmers was 46 years. The mean age showed that most of the yam producers in the study area are innovative and economically active in their agricultural undertaken as well as would be willing to accept the new technologies in agriculture in relation to yam production. This collaborated with Ubokodom, Esheya, and Udioko (2021), who reported that farmers within the active age are highly innovative and could adopt production input technologies easily compared to other aged farmers. Again, Amusa, Anugwo, and Esheya, (2017) reported that older farmers are not innovative and as such are not willing to accept new technologies unless at evaluation stage.

The result in Table 1 showed that majority (62%) of the yam farmers were married; followed by 25% who were widowed. This showed that most of the farmers in the area were married. This is true because early marriage is culturally encouraged in the study area. In the same vein, family labour is easily sourced among married people as pointed out by Michael (2011) who reported that a high percentage of married farmers favoured provision of cheap family labour supply by members of the farm family. Similarly, married people play more active roles in rural household income improvement and technology adoption as they desire to enhance their production in order to meet their family responsibilities (Abah, Esheya & Ocheche, 2021).

In a traditional society, the size of household practically determines its labour. On this background, the result showed that 60% of the yam producers have a household size of 6-10 persons; while 20% lived with less than or equal to 5 persons in their household and others (20%) had a household size above 10 persons in their households. The average household size of the yam farmers in the study area was 8persons. This entails that the household size of the yam farmers is large as most of them have realized the importance of labour force due to the economic situation of the country. Most rural households in the area relied more on family labour supply than hired labour in order to save money that would have been paid to hired labour.

Many poorer households engage their members into hired labour in order to generate income for improvement of their family welfare. This is in line with the report of Nwibo (2012) who reported that larger household size is a cheaper means of providing farm labour and reducing labour cost among the yam producers.

The yam farmers' educational level of attainment was examined and the result presented in Table 1 showed that 67.5% of the farmers had primary education; while 22.5% had tertiary education where others, (10%) had secondary education. However, the mean number of years spent in formal schooling by the yam farmers was 8 years. This entails that the farmers attended secondary education. This is abysmally low in view of the free education policy of Ebonyi State Government. This however, implied that some of the farmers in the study area were literates and would easily adopt yam production inputs technologies more than their illiterate counterparts. This is in consonance with the observations of Osunde, and Orhevba, (2009) who observed that increase in level of education increases the involvement of people (yam producers) in development oriented programmes and innovation adoption. In addition, education makes farmers receptive to new ideas, technologies and or technologies. The result was also supported by Ibeawuchi (2007), who reported that education increases adoption and enhances farmers' ability to understand and evaluate production inputs technologies. Furthermore, Table 1 revealed that majority (39.4%) of the farmers engaged in civil service in addition to farming occupation in the area. where 36.2% and 24.4% engaged in trading and artisans respectively. Engaging in other activities is imperative as it encourage the yam producers to diversify their income leading to an increase in their annual income of their respective households.

Results also revealed that farmers in the area had average farm income of ₦136,812.50 per annum. The result had shown that the income level of the yam farmers were moderate and could be attributed to good management of their farms resulting to increase in their outputs/yields in the area. The moderate income of the yam farmers could translate to household welfare and great opportunity to inputs technology adoptions. This was supported by Etejere and Bhat, (2016), who reported that increase in income would enable poor households save more financial resources and consequently gain required financial ability to invest in agricultural production. The result also showed that the farmers in the area had average farming experiences of 13 years. This showed that most of the farmers studied was actually experienced farmers. This also showed that the number of years a farmer spent in farming operations according to Esheya (2018) may give an indication of the practical knowledge he/she had acquired on how to overcome certain inherent farm problems. However, Etim,

Thompson, and Onyenweaku, (2013), also reported that experience enables farmers to set a realistic goal and adopt innovations more readily than inexperienced farmers.

Result also showed that the farmers operated on an average farm size of 1.45 hectares. This implied that the yam farmers were mainly smallholder farmers who cultivated on less than 5 hectares of land which was the major characteristics of smallholder farmers. Again, the result also implied the fragmented nature of land holding due to the tenure system of land ownership that encourage continuous fragmentation of land; which discourage commercial Agricultural practices. This was because two third of the rural population live on small farms less than two hectares, characterized by low technology, the use of family labour and subsistence orientations as reported by Battese, and Coelle, (2015).

Result shows that minority (30%) of the yam farmers had contact with extension service delivery agents; whereas few 70% had no contact. This implies that there is low level of access to extension services among the yam farmers in the study area. This implied also that there will be increase in the access to information among the farmers in their agricultural undertaken. Result shows that minority (30) % of the farmers had access to extension service delivery twice in a year. These imply that there is need to increase the frequency of contact with extension services among the yam farmers. This is necessary as it would improve the level of adoption and access to agricultural inputs necessary for the much needed increase in productivity. This is because extension agents are custodians of relevant farm information and could act as possible links to inputs acquisition.

#### Various Varieties of Yam Produced in the Area

The varieties of yam produced among the farmers in the study area were identified and the results obtained were presented in Table 2.

**Table 2: Various Varieties of Yam Produced in the Area**

Source of information	Frequency	Percentage
Water yam	144	90.0
Yellow yam	112	70.0
White yam	160	100.0
Chinese yam	128	80.0
Three-leave- yam	32	20.0

Source: Field Survey, 2022

Result revealed that water yam (90), yellow yam (70), white yam (100), Chinese yam (80) and three-leaf-yam (20) were the various yams produced in the area. This may be that these are the only available varieties in the area and can thrive well despite the low level of soil nutrients existing in the area. The result however, revealed that the highest

produced yam varieties in the area was white while the lowest produced varieties was three-leave yam.

#### Cost and Returns of yam production in the Area

The cost and return from yam production in the area was estimated using gross margin analysis and the result presented in Table 3. Table 3 shows cost and return structure of yam production in the study area.

**Table 3: Estimated Costs and Returns of Yam Production in the Study Area**

Items	Unit Price (₦)	Qty	Total ₦/Ha	Percentage (%) of Total Cost
<b>Fixed costs (FC)</b>				
Land	20,000	1	20,000	21.26
Basket	300	10	300	0.41
Hoe	2,400	2	480	0.65
Hand Glove	1000	1	100	0.48
Matchet	2000	2	400	0.54
Basin	4600	1	460	0.63
Wheel Barrow	11,000	1	1100	1.16
<b>Total Fixed Cost (TFC)</b>			<b>22,840</b>	<b>24.27</b>
<b>Variable Cost (VC)</b>				
Yam Seedlings	200	206 (Tubers)	41,200	43.79

Chemicals	1150	2	2,300	2.44
Transportation		Lump sum	3250	4.42
Labour	2,450	10	24,500	26.04
<b>Total Variable Cost (TVC)</b>			<b>71,250</b>	<b>75.73</b>
<b>TOTAL COST (TC)</b>			<b>94,090</b>	<b>100.00</b>
<b>Total Revenue (TR)</b>				
Output of Yam	500	284	<b>142,000</b>	
<b>Gross Margin (GM) = TR –TVC</b>			<b>70,750</b>	
<b>Net Farm Income = GM-TFC</b>			<b>47,910</b>	
<b>(ROI) = NR/TC</b>			<b>0.51</b>	
<b>BCR = TR/TC</b>			<b>1.51</b>	

Source: Field Survey, 2022; Note: 10% was taken from the original cost of fixed items

Table 3 depicted that ₦22,840 representing 24.27 % of the total cost was spent on fixed cost items/ha and the remaining ₦71,250 representing 75.73% of the total cost was spent on variable cost items/ha. This implies that variable cost were the most important cost items in yam production in the study area compared to the fixed cost items. Among the variable cost items, ₦24,500 representing 26.04% of the total cost was spent on labour followed by yam seedlings/ha representing 43.79% of the total variable cost. This means that land, yam seedlings and labour were the most vital variables to be considered first in yam production. Banmeke, T.O.A (2010), obtained up to 63.28% and 72.27% of the total cost spent on labour/ha in pepper production by the Fadama participating and non-participating households, respectively. Similarly, Esheya, Okoye and Nweze (2022), realized that 72% of the total cost of cost of farm production was spent on labour. The Table 3 revealed further that an average of ₦47,910/ha of the total revenue from production of yam was realized as net profit/ha. This means that yam cultivation in the study area is profitable. It is therefore desirable that more farmers should be encouraged to engage in yam production so that income generating capacity of farmers in the study area can be boosted. Similarly, result revealed a gross margin of ₦70,750 with revenue of ₦142,000 per hectare of farmland. The return on investment estimated was 0.51 which implied that; to every one naira invested will result to ₦0.51k gain. The overall implication of this result is that the yam producers are producing at subsistence level and sell little for other household needs.

#### Hypothesis Tested

$H_{01}$ : There is no significant difference between cost and returns of yam production in the area. From the rule of thumb, reject null hypothesis if  $t_{cal} > t_{tab}$ , otherwise accept. Results showed that  $t_{cal} (49.848) > t_{tab} (1.94)$  thus, the null hypothesis which stated that There is no significant difference between cost and returns of yam production in the area was tested using t-test at 5% level of significance in the area was rejected and the alternative accepted (Table 3).

#### CONCLUSION

The study was economic analysis of yam production in Ohaukwu Local Government Area of Ebonyi State, Nigeria. This study had shown that yam production is profitable in the area and there is significant relationship between the socio-economic characteristics of yam farmers and their quantity of yam output in Ohaukwu Local Government Area of Ebonyi State, Nigeria. The null hypothesis which stated that there is no significant difference between cost and returns of yam production in the area was tested using t-test at 5% level of significance in the area was rejected and the alternative accepted. Although the farmers were hindered by infrastructural, institutional and economic factors but it was suggested that exogenous supports such as provision of credit facility and timely supply of farm inputs to farmers would enhance the production of yams among the farming households in the study area.

#### RECOMMENDATIONS

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

- i. Agricultural extension agents should make better varieties of yam available to the farmers to improve their productivity.
- ii. Exogenous supports such as provision of credit facility to farmers would enhance the production of yams among the farmers.
- iii. Improved availability of information to farmers and other farmers from within and outside the study area will enable them to explore opportunities to improve their productivity and livelihoods.

#### REFERNCES

- Abah, D., Esheya, S. and Ochoche, C. O. (2021). Effect of Maize Production on Agricultural Output in Nigeria (1981-2019): Implication for Sustainable Development. *International Journal of Agricultural Economics, Management and Development (IJAEMD)*, 9(1); 42 – 54.
- Adamu, B.D. and Esheya, S.E. (2022). Factors influencing participation of Irish potato farmers of

- the women in agriculture and youth empowerment programme on livelihood of Irish potato farmers in Plateau state. *Jigawa Journal of Multi-Disciplinary Studies*. A publication of the faculty of education, Sule Lamido University Kafin Hausa, 5 (1):130 -152
- Agwu, A. E. and Alu, J. I (2015). Farmers' perceived constraints to yam production in Benue state. Nigeria. Proceedings of the 39th Annual conference of the Agricultural Society of Nigeria, 347-50.
- Amusa, T. A; Anugwo, S. C; & Esheya, S. E. (2017). Factors influencing processors' willingness to engage in mechanized palm fruits processing in Abia state, Nigeria. *The Nigeria Agricultural Journal*, 48 (2): 236-247.
- Ayanwuyi. E, Akinboye, A.O., and Oyetoro J. O. (2011). Yam Production in Orire Local Government Area of Oyo State, Nigeria: Farmers' Perceived Constraints. *World Journal of Young Researchers*, (2):16-9.
- Bamire, A. S and Amujoyegbe, B. J (2005). Economic analysis of Land improvement techniques in small-holder Yam-Based Production systems in the agro-Ecological Zones of South Western, Nigeria. *Journal of Human Ecology*. 18(1): 1-12.
- Banmeke, T.O.A. (2010). *Accessibility and utilization of Agricultural Information in the Economic Empowerment of Women Farmers in South Western Nigeria*. Unpublished PhD Thesis, Department of Agricultural Extension and Rural Development, University of Ibadan, Nigeria.
- Battese, G. E. and Coelle, T. J. (2015). A model for technical inefficiency effects in stochastic frontier production for panel data, *Empirical Economics*. 20:325- 345.
- Ebewore, S. O., Egbodion, J. And Oboh, O. O. (2013). Profitability Analysis of Yam Production in Ika South Local Government Area of Delta State, Nigeria. *Journal of Biology, Agriculture and Healthcare*. 3(2).
- Esheya, S. E., Okoye, C.U. and Nweze N.J. (2022). Socio-Economic Effects of Chemical Pollution on Agricultural Production in Mineral Mining Communities of South-East Nigeria. *AKSU Journal of Agricultural Economics, Extension and Rural Development*. Department of Agricultural Economics and Extension, Akwa Ibom State University, AKSU, Uyo, Nigeria, 5 (1): 12 – 18.
- Esheya, S. E. (2021). Economic Analysis of Gari Processing in Ebonyi State, Nigeria. *Nigerian Agricultural Journal (NAJ)*, 52 (1): 237-241.
- Esheya, S.E. (2019). Economics of cassava production in Ohaukwu local government area of Ebonyi state, Nigeria. *AKSU Journal of Agricultural Economics, Extension and Rural Development*, 2 (2): 92 – 98.
- Esheya, S. E. (2018). Assessment of agro-chemicals utilization among rural farmers in Ebonyi state, Nigeria. *AKSU Journal of Agricultural Economics, Extension and Rural Development*, 1(1): 11-14.
- Esheya, S. E. (2012). Economic effects of limestone exploitation on crop production in Ebonyi State. *International Journal of Agricultural Economics, Management and Development*, 2: 124-144.
- Etejere, E. O. and Bhat, R. B. (2016). Traditional and Modern Storage Methods of Underground Root and Stem Crops in Nigeria. *Turrialba*, 36(1): 33–37.
- Etim, N. A., Thompson, D. and Onyenweaku, C. E. (2013). Measuring efficiency of yam (*Dioscorea* spp.) production among resource poor farmers in rural Nigeria. *Journal of Agriculture and Food Sciences*, 1(3): 42–47.
- FAO (Food and Agricultural Organisation) (2008). FAO Annual Report. Food and Agriculture Organisation Production Year Book. Food and Agricultural Organisation) of the United Nations, Rome.
- Ibeawuchi, I. I. (2007). Intercropping. A Food Production Strategy for the Resource Poor Farmers. *Nature and Science*. 5(1): 46–59.
- Iwueke, C.C., Mbata, E. N. and Okereke, H. E. (2003). Rapid Multiplication of seed yam by mini-sett technique. *National Root Crops Research Institute, Umudike, Abia State, Nigeria, Advisory Bulletin* (9):5.
- Mbah, S.O. (2010). Analysis of Factors Affecting Yam Production in Ngor-Okpala Local Government Area of Imo State. In J. A. Akinlade; A. B. Ogunwale; V.
- Michael, O.F. (2011). Measuring technical efficiency of yam farmers in Nigeria: A stochastic parametric approach. *Agricultural Journal* 6: 40-46.
- National Population Commission (NPC). 2006. Population Census of the Federal Republic of Nigeria. Census Report. National Population Commission, Abuja.
- Nwibo, S. U. (2012). Effect of agricultural exports on food security in Ebonyi State, Nigeria. *Journal of Agricultural Research and Development*, 2(3): 77–82.
- Odigbo, B.E., Ogbidi, J.B. and Ewa, E.A. (2015). A situation analysis study of yam distribution strategies of farmers in Boki Local Government Area of Cross River State. *Nigeria Journal of Economic and Sustainable Development*, 6(14): 190-201
- Osunde, Z.D. and Orhevba, B.A. (2009). Effects of storage conditions and storage period on

- nutritional and other qualities of stored yam (*Dioscoreaspp*) tubers. *AJFAND* 9(2): pp. 678 – 690.
- Passam, H.C., Read, S.J. and Rickard, J.E. (2018). The respiration of yam tubers and its contribution to storage losses. *Trop. Agric* (55): 207 – 214
- Sahore, D.A., Nemlin, G.J. and Kamenan, A. (2007). Changes in nutritional properties of yam (*Dioscoreaspp*), green plantain (*Musa spp*) and cassava (*Manihotesculenta*) during storage. *Food Science and Technology*, (47): 81 – 88
- Serge, T. and Agbor-Egbe, T. (2016). Biochemical changes occurring during growth and storage of two yam species. *International Journal of Food Science and Nutrition* 47: pp. 93-102.7
- Spittstoesser, W.E. and Rhodes, A.M. (2013). Protein and amino acid values of some tropical root crops. *Illinois Research* 15(4): pp. 6-7.
- Twumasi, J.K. (2016). Fungi associated with tar spot disease of water yam in Ghana. *Ghana Journal of Agricultural Science*. 14(19): pp. 115-116.
- Ubokudom, E. O., Esheya, S. E. and Udioko G. U. (2021). Profitability of Biofortified Yellow Cassava Farming in Nigeria: Empirical Evidence from Akwa Ibom State. *AKSU Journal of Agriculture and Food Sciences*. 5 (2): 100-112.
- Verter, N. and Bečvařova, V. (2014). Yam production as pillar of food security in Logo Local Government Area of Benue State, Nigeria. *EuropeanScientific Journal*, 10(31): 27–42.
- Zaknayiba, D. B. and Tanko, L. 2013. Costs and returns analysis of yam production among small scale farmers in Karu local government area, Nasarawa State, Nigeria. *PAT*, 9(1): 73–80.