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ECONOMICS OF COCOYAM PRODUCTION IN ORSU LOCAL GOVERNMENT AREA, IMO STATE, NIGERIA.

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ABSTRACT

The study examined the Economics of Cocoyam Production in Orsu Local Government Area of Imo State Nigeria. The specific objectives were to describe the socio-economic characteristics of cocoyam farmers in the study area, to estimate the cost and return of cocoyam production in the study area, to determine the factors influencing cocoyam output in the area, and to estimate the profitability of cocoyam in the study area. Primary data were collected using a set of structured questionnaires from 50 respondents who were selected through 3-stage, random and purposive sampling techniques. Data for 50 respondents were analyzed using descriptive statistics, Gross Margin Model, Ordinary Least Square multiple regression analysis and Profitability Index Model. The results showed that the mean age of the respondents was 33.9 years, mostly female, married, mean household size of 7 persons per household, mean farm size of 0.04 hectares and mean farm experience of 17.7 years. The results further showed that the cost and return analysis indicated that the total cost incurred in cocoyam production was ₦28,260 and total return of ₦75,000 was realized from sales of cocoyam, making a net income of ₦46,740 while the internal rate of return was 1.65 this shows that for every ₦1 invested in cocoyam ₦1.65kobo was realized. The results of the factors influencing cocoyam output showed that the value of coefficient of multiple determinations (R^2) was 0.974% which implies that 97.4% of the variation of the factors influencing cocoyam output was accounted for by the explanatory variables in the model. Variables such as quantity of fertilizer ($p < 0.01$), farm experience ($p < 0.05$), access to credit ($p < 0.1$), household size ($p < 0.01$), membership of cooperative ($p < 0.1$), labour use ($p < 0.01$). The profitability of cocoyam was 2.44 which showed high profitability. It was recommended that policies that will enable women to own a farmland should be enacted by governments at all levels, education of the farmers should be paramount in the study area and farmers themselves should form or join cooperative societies access credit and build capital formation for cocoyam production.

Keyword: Economics, Costs, Return, Output, Profitability, Cocoyam

Introduction

Cocoyam is grown in the tropical regions of the world especially in Africa, where it is cultivated for food (Food and Agricultural Organization, (FAO), 2015). The food crop which is mainly grown in the rural communities across Africa by subsistent farmers is highly valued among other tuber and root crops consumed among different households, the high cost of production is mainly due to the high labour requirement during cultivation amid the use of indigenous planting materials, application of total weed controls as well as limited value addition have led to a general decline of the cocoyam subsector (S. Boakye-Achampong, K. Ohene-Yankyer, R. Aidoo and O.J. Sørensen, 2017).

Cocoyam as a tuber crop is intensively cultivated and consumed by resource poor families in South Eastern and South Southern parts of Nigeria (Shiyam; Obiefuna; Ofoh; Okoh and Uko, 2015), the leaves are often used as wraps for foods in some parts of African and Asia; the crop most times is grown as ornamentals (Mikami and Tsutsui, 2019). Cocoyam

leaves are nutritious spinach-like vegetable which gives a lot of minerals, vitamins (A and C), and thiamine (Sharma; Jan; Kaur; and Riar. (2020) and Onwubuya and Ajani, 2015).

There are two main species commonly cultivated in Nigeria the species are *Xanthosoma* called Tannia and *colocasia* called Taro (Otekunrin, Sawicka, Adeyonu, Otekunrin, and Rachon, 2021; Okoye, Okoye, Okoroafor, and Amaefula, 2015).

Colocasia originated in South East Asia and was introduced to Africa through Egypt and has been known for over 2,500 years. It then spread across the east coast of Africa and across the continent to West Africa (Otekunrin *et al*, 2021). *Xanthosoma* originated in tropical America and was introduced to West Africa by Indian missionaries (Puraeglove 2015).

Cocoyam plays a significant role in bridging the food gap between the time of plenty and scarcity and also has rich economic and socio-cultural connotations, cocoyam has better nutritional qualities than other root and tuber crops such as cassava and yam, with higher protein, vitamin and mineral contents; a versatile

staple crop, cocoyam can also be used as weaning food for nursing mothers, while the leaves can be cooked as vegetable in some parts south-east and south-south regions of Nigeria. Cocoyam production, marketing and consumption are interwoven enterprises that sustain many rural dwellers (Boakye, Wireko-Manu, Oduro, Ellis, Gudjónsdóttir, Chronakis, 2018).

Nigeria is reported to be the second largest producer of cocoyam in the world with annual output of 4.55 million metric tons, representing 61.2 % and 43.1 % total production in West Africa and Africa, respectively (FAO, 2015). However, in 2019, Nigeria is reported as the highest producer of taro (cocoyam) globally with about 2.86 million tonnes and 27.14% share of world total production in 2019 (Food and Agriculture Organization Statistics, (FAOSTAT), 2021). It is a cash crop and a foreign exchange earner, as well as an important component in the rural development of many areas and individuals. The crop is among the tuberous roots very well adapted to most agro-ecological zones of Nigeria. It is available all the year round, making it preferable to most other root and tuber crops. It is also resistant to drought and tolerant to a variety of climatic and soil conditions (Ogunniyi, 2015). Despite its wide adaptability as well as its nutritional and economical values, cocoyam output performance in the country has remained below expectation ranging between 5 and 7.5 tons per hectare (Otekunrin ; Sawicka; Adeyonu ; Otekunrin and Racho', 2021). Although there have been significant increases in the total output of cocoyam in West and Central Africa in recent times, these, however, are due to increased harvested area rather than increase in output per land area due to cropping mix of cocoyam with other food crops. This as a result has helped in the efficiency of the use of allocated resources for the production of different food crops (Okereke. 2020).

Most of the Nigerian cocoyam is grown in the South Eastern part of the country and Imo State is one of the highest producers of cocoyam with 132.0 metric tons (Okeke 2019; Olayide, 2016). Given that cocoyam is an important staple food in Nigeria, any attempt to improve its productivity would be a right step towards the resolution of the food crisis. And encourage the production of cocoyam as a substitute to yam and other tubers that are mostly consumed. Unlike yam and cassava, the production has not been given necessary attention, farmers allocate resources to other food crops more than how they allocate to cocoyam, owing to it as women crop. This has seriously affected the production of cocoyam over time. In addition, cocoyam would have been a major source of raw material for the production of essential vitamins as the crop is rich in essential vitamins and mineral nutrients, but due to neglect and under exploited, this vitamins and mineral nutrients remain untapped, neglecting the health benefits of the crop to improve the health relief of the people (Boakye *et al.*, 2018)

In addition, low level of adoption of new technologies and continued preference to old system could be related to low productivity of cocoyam and improvement in the scale of production, this have become economic challenges to farmers who wants to upscale their income to support their families. Expansion in cocoyam production has the potential of bridging the wide gap of demand and supply and enhancing income of rural farmers (Ifeanyi-Obi, Togun, Lamboll, Adesope, and Arokoyu, 2017). Several researches have been carried out by various scholars on profit efficiency, profit efficiency of small holders cocoyam based farmers, technical efficiency of cocoyam and economic analysis of cocoyam marketing by (Abdulrahman, Yusuf and Suleiman, 2015; Afolami and Ogungbenro, 2018; Abdulrahman, Yusuf, Sanni and Ayinde, 2018; Enibe *et.al*, 2019), none have been able to look at the economics of cocoyam production. This study will be used to fill up the research gap that existed in the economics of cocoyam production in Orsu Local Government Area of Imo State, Nigeria using econometric tools and other analytical tools.

Objectives of the study

The specific objectives are:

- (i) to describe the socio-economic characteristics of cocoyam farmers in the study area;
- (ii) to estimate the cost and return of cocoyam production in the study area.
- (iii) to determine the factors influencing cocoyam output in the area.
- (iv) to estimate the profitability of cocoyam in the study area.

Materials and Methods

Study Area

This study was carried out in Orsu Local Government area of Imo state. Orsu LGA is in Orlu Agricultural zone, it shares boundaries in the East with present Orlu LGA, in the West with Oru East, in the South with Njaba and with Ihiala LGA in the North. Orsu is located between latitudes $5^{\circ}10'N$ and $5^{\circ}21'N$ of the equator and between longitudes $6^{\circ}32'E$ and $6^{\circ}52'E$ of the Greenwich Meridian. It is situated within high populated Eastern Heartland with 165,600 inhabitants estimated to 2016 (National Population Commission (NPC), 2016) and 194,223 inhabitants projected to 2020 (Imo State gov.)

The Local Government Area occupies a total land area of 65.5 km². The L.G.A headquarters is located at Orsu Ihite- Ukwu with 11 autonomous communities. The people in the area are predominantly farmers with few traders. The crops cultivate are cocoyam, yam, cassava, vegetables, and maize. The area produces cash crops such as palm oil, coconut, as well as livestock like goat, sheep and poultry.

Sample Selection

This study involved three stage, purposive and random sampling techniques in selecting the respondents for the study.

The first stage involved random selection of five (5) communities out of the 11 autonomous communities in Orsu Local Government Area.

The second stage involved the random selection of two (2) villages from the five (5) autonomous communities making a total of 10 villages

The third stage involved the purposive selection of five (5) cocoyam farmers each from the villages due to their level of engagement in cocoyam production and successes recorded over the years in the cocoyam production in these villages, making a total of 50 cocoyam farmers. Then, the 50 cocoyam farmers then formed the sample size for the study.

The data collected for this study were analyzed using descriptive statistical tools, Ordinary Least Square regression model, the Gross margin model and productivity model.

The model for estimating cost and return of cocoyam output is expressed as used by Okoye *et al.*, 2015 as follows;

$$GM = TR - TVC \quad \dots \text{equ 1}$$

The net farm income is expressed as follows

$$NFI = TR - TC \quad \dots \text{equ 2}$$

Where; TR = Total revenue, TVC = Total Variable Cost, TFC = Total Fixed Cost TC = Total Cost, and the Ordinary Least Square regression model used to determine the factors influencing cocoyam production is specify implicitly as follows;

$$Y = f[X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, e]$$

Where Y = Output (₦/ha) =

X_1 = Age (years)

X_2 = Quantity of Fertilizer (Kg)

X_3 = Sex (1= Male, 0= Female)

X_4 = Farming experience (Years)

X_5 = Educational attainment (Years)

X_6 = Access to Credit (1 = Yes, 0 = No)

X_7 = Household size (Number of persons)

X_8 = Membership of a cooperative society (1= Yes, 0 = No)

X_9 = Labour use (Mandays)

e = error term

...equ 3

Value of the quantity of cocoyam harvested (₦)

Farm size in hectare (ha)

Four functional forms linear, semi log, exponential, double log, the functional form with the highest value of the coefficient of multiple determination (R^2), highest number of significance variable and highest F- ratio will be chosen in the equation to describe the factors affecting the production of cocoyam in the study area.

It is expected *a priori* that $X_4, X_5, X_6, X_7, X_8 > 0$; $X_1, X_2, X_3, X_9 < 0$

The profitability index model for estimating profitability of cocoyam as used by Knoema, (2017) is stated as follows;

$$\text{Profitability index model} = \frac{\text{Net Farm Income}}{\text{Total variable cost}} \quad \dots \text{equ 4}$$

Decisions

If PI = 1 then the profitability is total or at break even

If PI > 1 then the profitability is high

If PI < 1 then the profitability is low

Results and Discussions

(A) Socio-economic characteristics of the respondents

Table 1: Distribution according to socio-economic characteristics of the respondents

Variables	Frequency	Percentage
Age		
31 – 40	10	20
41 – 50	25	50
51 – 60	13	26
61 and above	2	4
Total	50	100
Mean	33.9 years	
Gender		
Male	19	38
Female	31	62
Total	50	
Marital status		
Married	33	66
Single	4	8
Separated	9	18
Widowed	4	8
Total	50	100
Education level		
Primary education	11	22
Secondary education	8	16
Tertiary education	7	14
No formal education	24	48
Total	50	100
Farming experience		
1 – 10	2	4
11 – 20	37	74
21 – 30	9	18
31 and above	2	4
Total	50	100
Mean	17.7 years	
Household size		
1 – 5	15	30
6 – 10	35	70
Total	50	100
Mean	6.5 persons	
Farm size		
1.01 – 0.03	5	10
0.04 -0.07	35	70
0.08 – 0.1	10	20
Total	50	100
Mean	0.04 hectares	

Source: Field Survey Data, 2021

Table 1 shows that the mean age of the respondents is 33.9 years. This implies that the respondents in the study area are young in their youthful ages, resourceful and capable of doing farm work. This result agreed with the findings of Adegboye (2016) which observed that youth constitute the majority of the cocoyam farmers. Younger farmers are more flexible to new ideas and risk; hence they are expected to adopt innovations more readily than older farmers. Table 1 further shows that 62% of the respondents are females which showed the majority, while 38% of them are males. This result indicates that cocoyam

production in the study area is dominated by females. This finding confirms the general believe in the communities that cocoyam is a woman's crop. This is in line with the findings of (Quaye et al., 2014) and confirms the findings of Azeez and Madukwe, (2015) that women participate actively in cocoyam production more than their male counterpart. The result shows that majority of the respondents are married,(66%). The high percentage of married farmers correlated with the submission of Okoye *et al.*, (2015) who asserted that marriage indicates some level of responsibility, commitment and stability, it

shows that these farmers are stable enough to continue to carryout cocoyam production activities, since marriage is highly cherished value in the society. Moreso, Table 1 also shows that 48% of the respondents indicating majority had no formal education, this result shows that most of the respondents are not well educated but have indigenous knowledge in making production decisions that affects positively in their cocoyam production. This finding is not in consonance with the work of Okeke (2015) who reported that literate farmers have been found to adopt new production ideas faster than illiterates' farmers in achieving production efficiencies.

Furthermore, Table 1 also shows that the mean farming experience is 17.7 years. This implies that the respondents have been in production of cocoyam for quite a long time. They are therefore described as experienced and are expected to have higher efficiency that will help to boost their productivity. Farming experience helps the farmers to take production decisions in terms of when to produce and how to produce. This is in line with the findings of Okoye et al., (2015) that with more experience, a farmer can become less averse to the risk implied by adopting a new technology.

In addition, Table 1 shows that the mean household size of the cocoyam farmers is 7 persons per household. This result implies that the respondents have access to family labour and hence, this is expected to reduce cost of production. Household size has a great role to play in providing family labour for agricultural production. This is consistent with the findings of Obasi et al., (2015) that large household means that the farmers may not need to spend so much money on hired labour since the family could provide the much needed labour input. This is in line with the findings of Henri-Ukoha et al., (2015), which says that with large household size, most of the labour force can be sourced within the household.

Finally, Table 1 shows that the mean farm size of the respondents is 0.04 hectares indicating a small farm size less than one hectare of farmland. This can be explained by the fact that majority of the farmers were female and these women don't have access to land in the area. According to Baruwa and Oke, (2014) farm size has direct relationship with output. This is consistent with the findings of Azeez and Maduekwe, (2015) which says that when farmers have access to reasonable hectarage of land, this will enable mechanization and with good management, better resource allocation can be employed by farmers to bring about the much desired increase in food production and food security.

(B) Cost and returns of cocoyam production

Table 2: Distribution of the respondents according to their cost and returns to cocoyam production per hectare

ITEM	QUANTITY	UNIT PRICE (₦)	TOTAL PRICE (₦)
A. REVENUE			
Sales of cocoyam	3bags	25,000	75,000
Total revenue			75,000
B. FIXED COST			
Rent on land			4,000
Depreciation on farm tools			5,130
Total fixed cost			9,130
C. VARIABLE COST			
Cost of labour (manday)	2 persons	2,000	4,000
Cost of transportation			1,500
Cost of agro-chemicals	3 litres	2,210	6,630

Cost of fertilizer	2 bags	3,500	7,000
Total variable cost			19,130
D. TOTAL COST (TFC+TVC)			28,260
Gross margin (TR-TVC)			42,050
Net farm income (TR-TC)			46,740
IRR			1.65

Source: Field Survey Data, 2021

Table 2 shows that the structure of cost and return analysis of cocoyam production per hectare in the area of study. The average inputs used in production listed in the table was based on variable cost and fixed cost respectively. The cost of 3 bags of cocoyam was ₦75000 selling at ₦25000each. Cost of labour was ₦4000 for 2 persons at ₦2000 each, cost of agro chemicals was 6630 for 3 litres at ₦2210 per litres and 2 bags of fertilizer was at ₦7000 and 3500 per bag.

The Table indicates that the total cost of cocoyam production was ₦28,260 and total revenue of ₦75,000 was realized from sales of cocoyam, making a net income of ₦46,740 while the internal rate of return was 1.65 this shows that for every ₦1 invested in cocoyam ₦1.65kobo was realized. This indicates that cocoyam is a profitable enterprise in Orsu local Government area of Imo state.

(C) Factors Influencing Cocoyam Output in the study area

Table 3: Estimated factors influencing cocoyam output.

Explanatory variables	Linear function	Exponential function	Semi-log function	+Double function	log
Constant	2176140.937 (0.859)	14.322 (20.266)***	-111353323.727 (-1.708)*	-28.437 (-2.180)**	
Age	-6099.058 (-0.097)	0.010 (0.575)	-9075080.997 (-1.048)	-0.197 (-0.114)	
Quantity of fertilizer	139.593 (2.327)**	3.599e-5 (2.152)**	4343624.812 (2.639)**	1.279 (3.884)***	
Gender	575629.641 (0.605)	0.205 (0.774)	3591405.168 (1.539)*	0.383 (0.819)	
Farm experience	-44963.066 (0.929)	-0.011 (-0.837)	-287321.701 (0.173)	0.118 (2.356)**	
Educational level	127424.292 (0.345)	0.016 (0.154)	341014.971 (0.139)	0.4741 (0.968)	
Access to credit	-1573353.421 (1.960)*	-0.492 (-2.199)**	-2852961.570 (-1.143)	0.742 (-1.587)*	
Household size	137176.578 (0.668)	-0.003 (-0.54)	-3181771.372 (-1.173)	-1.591 (-2.930)***	
Membership of cooperative	1257832.971 (1.545)*	0.338 (1.490)	287396.830 (0.084)	-0.510 (-1.741)*	
Labour use	0.845 (0.07)	-8.832e-6 (-0.281)	13150611.336 (2.336)**	3.939 (3.497)***	

R²	0.416	0.435	0.955	0.974s
Adjusted R²	0.154	0.180	0.550	0.742
F-value	1.586	1.710	2.360	4.200

Source: Field Survey Data, 2021

*= significant at 10%, ** = significant at 5%, *** = significant at 10% value in parenthesis are t-values ,
+ = lead equation.

Table 3 shows that the double log functional form provided the lead equation. The value of coefficient of multiple determinants (R^2) was 0.974% which implies that 97.4% of the variation of the determinants of the factors influencing cocoyam output of respondents in the study area was accounted for by the explanatory variables in the model. Variables such as quantity of fertilizer ($p < 0.01$), farm experience ($p < 0.05$), access to credit ($p < 0.1$), household size ($p < 0.01$), membership of cooperative ($p < 0.1$), labour use ($p < 0.01$).

Coefficient of quantity of fertilizer was significant at 1% and positively related to output. This implies that an increase in the Quantity of fertilizer used will increase output. This shows how important fertilizer is to cocoyam farmers. Lack of fertilizer on cocoyam production affects level of output.

Coefficient of farming experience was significant at 5% and was positively related to the factors influencing cocoyam output in the study area. This implies that as farmers experience increases, output also increases as the farmers through experiences knows when to allocate resources to achieve optimum output. This shows that the more experience the farmers are the more they consistently achieve optimum level of output. This shows that experienced farmers adopts new technologies that will achieve higher output.

Coefficient of access to credit was significant at 10% and negatively related to factors influencing output of cocoyam. This implies that credit decrease, output of cocoyam in the study area increases by 10 percent.

This shows that in the study area, when the farmers do not have access to credit, they tend to increase their output, having enough to sale rather than servicing the cost of credit. The negative sign shows that cocoyam farmers in the study area do not use credit.

Coefficient of household size was significant at 1% and negatively related to output. This implies that as household size increases, output of cocoyam decrease by 1%. The size of household affects the output as majority of their output are consumed by household with large number of persons.

Coefficient of membership of cooperative was significant at 10% and negatively related to output. This implies that membership of cooperative decreases output by 10%. This shows that when the farmers do not belong to any cooperative society, the farmer will not be able to access some resources that will boost their output. The negative sign shows that cocoyam farmers in the study area do not participate in cooperative societies.

Coefficient of labour use was significant at 1% and positively related to output of cocoyam farmers in the study area. This implies that labour directly affect output by 1%, increase in labour used increase output. As the farmers employ more labour in production, more farm sizes will be cultivated thereby increasing the size of output in the study area. This shows that labour is required in the production of cocoyam in order to meet the demand thereby increasing the output of cocoyam farmers.

(D) Profitability of cocoyam production in the study area

Table 4: profitability of cocoyam

Cost	Values (₦)
Net farm income	46,740
Total Variable Cost	19.130
Profitability ratio	2.44

Source: Field Survey Data, 2021

Table 4, shows that the profitability ratio is 2.44, this shows that the profitability ratio of cocoyam is greater than one. This implies that the profitability of

cocoyam is high in the study area. Since the profitability ratio is 2.44, it implies that cocoyam

production in Orsu Local Government Area of Imo state is profitable.

Conclusion

The study shows that the respondents were in their youthful age, agile, resourceful and very active in cocoyam farming; are mostly female and are married. Having household size of 7 persons per household, well experienced in cocoyam farming. The study also shows that cocoyam production in the study area was profitable showing a profitability ratio of 2.44, indicating a high economic relevance in the study area.

Recommendations

In line with the findings of this study, the following recommendation were made

1. Seeing that cocoyam production in the study area is women dominated who cultivate on a small farmland. Policies that encourage women to own a parcel of land should be formulated by government at all level to enable women to acquire as many farmland to boost their cocoyam production.
2. There is need for farmers' education in the study area since majority of them do not have formal education, it is necessary for governments and other stakeholders in agribusiness to deploy extension agents to educate the farmers on new innovations and farming techniques that will help them boost their production output.
3. Farmers in the study area should form or join any existing cooperative societies so that they can have access to relevant credit facilities and also boost their capital formation for cocoyam production.

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