

Profitability of Cocoyam Production and its Determinants in Cross River State, Nigeria

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ABSTRACT

Neglected and underutilized crops can play a vital role in achieving food security as humans concentrate on consuming a few food crops which have increased in price over time. Understanding the profitability of these crops can enhance farmers' decisions to grow them. Therefore, this study investigated cocoyam production profitability, factors responsible for its profitability, and the constraints faced in cocoyam production in Cross River State, Nigeria. Data collected primarily with the use of questionnaires were analysed with descriptive statistics, cost and return analysis, multiple regression and the Likert rating scale. The results revealed that the majority of cocoyam farmers were male, married, in their economically active age and operated on a small scale. Cocoyam production was a profitable venture as the farmers had a gross margin of N175, 822.45 (USD 428.04) per hectare of cultivated land with an operating ratio of 0.24 and a return on capital invested of 3.17. The factors that influenced the profitability of cocoyam production were education, household size, farm size, farm output, cooperative membership, access to credit and annual income. The major constraints faced in cocoyam production were inadequate access to credit, poor government support, high cost of inputs and poor storage facilities. To enhance cocoyam profitability, the study recommends the provision of farm inputs and financial support to inform of credit or grants to the farmers. This would not only increase their profit but also enhance the decision to increase production which will increase food availability and, in turn, reduce the problem of food insecurity.

Keywords: Cocoyam farming, food security, profitability, neglected and underutilized crops, agriculture

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INTRODUCTION

Food is a basic need of life and a source of nutrition required for a healthy life. Meeting the food demand remains a major challenge globally as the world population keeps increasing far beyond the food production rate. Issues such as ending world hunger, eradicating poverty, and assurance of food and nutrient security have remained on the front burner influencing world policies over the years (Omotesho, 2020). Africa is the world's most food-insecure continent, with relatively high and widespread inequalities, high rates of malnutrition and poverty, low rural incomes, and a worsening food trade balance. According to FAO (2019), out of the 39 currently food-insecure countries in the world, 31 are in Africa. More than 250 million people constituting about 20% (almost four times that of any other region in the world) of the African continent's population suffer from severe food insecurity (FAO, IFAD, UNICEF, WFP & WHO. 2020). However, in sub-Saharan Africa, the situation is more worrisome as the prevalence of undernourishment (PoU) is highest, affecting an alarming 239.1 million. Ironically, the majority of the poor and hungry are farm families who rely on agriculture for livelihood (FAO, 2019).

The population growth to farm output in developed countries is stable, but there is no compensation for this by the total farm output in developing countries like Nigeria (Adepoju & Awodunmuyila, 2008). However, the agricultural production growth rate has either stagnated or failed to keep pace with Nigeria's rapid population growth rate which led to food shortage, massive importation of food, and continuous increase in food prices. Thus, slow growth in agricultural production has been a serious problem affecting domestic policymakers in Nigeria.

Farming in Nigeria has not sufficiently assured sustainable livelihood for the rural populace because of reasons such as the low use of innovation and poor

commercialisation of the agricultural sector. Agriculture in Nigeria is widely practiced on a small-scale level and dominated by smallholder farmers. They used crude implements with a low level of innovation and as result have low farm yield compared to developed countries, where modern farming techniques are used. The level of commercialisation of most crops in Nigeria is therefore low as farmers' harvests are at times just about adequate to feed their households. Worse hits are some indigenous crops that have been relegated to accommodate other crops which farmers believe to either hold more economic value or to be easier to cultivate (Omotesho, 2020). These contributed immensely to the high food insecurity level in the country.

In trying to achieve a hunger-free society, neglected and underutilized crops have a key role to play. One of the neglected and underutilized crops is cocoyam. Cocoyam is an important root and tuber crop rich in carbohydrates. It is commonly grown in the middle belt and southern part of Nigeria. The two major types of cocoyam grown in Nigeria are *Colocasia esculentum* and *Xanthosoma sagittifolium* (Abdulrahman *et.al.*, 2015). It can grow in combination with other food and tree crops which are mostly practised in Nigeria by smallholder farmers. Almost all part of cocoyam is edible although it is widely grown for edible roots. The leaf of cocoyam is used in preparing soup in Nigeria, especially among southerners.

Cocoyam is medicinal and good for the body. Despite the nutritional and other advantages of cocoyam over some tuber crops, it remains neglected and underutilized with a low level of commercialization in many parts of Nigeria. This could be due to insufficient information about its profitability. The profitability of cocoyam is of importance as this is likely to influence farmers' decisions to increase the cultivation of cocoyam. It is also possible that farmers are faced with certain constraints that may hinder them from going into the cultivation of cocoyam on a large scale (Omotesho, *et.al.*, 2020). Meanwhile,

there is a need to increase food sources to meet the growing food demand in Nigeria and other countries. This can be achieved by increasing the output of important staples like cocoyam. To increase food availability, production and household consumption, cocoyam should be encouraged, putting into consideration its high-income generation, profitability, and medicinal value to diabetic patients (Abdulrahman *et al.*, 2015).

Most previous studies on cocoyam focused on its production (Adepoju & Awodunmuyila, 2008; Azeez, & Madukwe, 2010; Echebiri, 2004; Emodi, 2014; Eze, & Okorji, 2003; Falola *et al.*, 2014; Ifeanyi-Obi *et al.*, 2017; Okoye *et al.*, 2008; Okoye, & Onyenweaku, 2007; Quaye *et al.*, 2010; Talwana *et al.*, 2009). The few on its profitability (e.g., Abdulrahman *et al.*, 2015; Boakye-Achampong *et al.*, 2017; Ogunniyi, 2008; Ohajianya, 2005) did not assess the factors responsible for cocoyam profitability. Because of this, this study, therefore, focused on the drivers of profitability of cocoyam production to increase its production and commercialization. Specifically, this study investigated the profitability of cocoyam farming ventures, examined the factors influencing the profitability of cocoyam production, and identified the constraints faced in cocoyam production. This would bring to the limelight the factors that influence the profitability of cocoyam and how these factors can be used to increase the profitability of cocoyam which would enhance productivity to help solve the problem of food insecurity. It would also enhance participation in cocoyam farming in the country which could reduce unemployment. Understanding the profitability of cocoyam will encourage the youth to tap the many opportunities inherent in cocoyam production and hence make young people self-employed, and at the same time contributing to food and nutrition security.

METHODOLOGY

The Study Area

This study was conducted in Cross River State, Nigeria. The state shares a national border in the south

with the Akwa-Ibom states, in the west with Ebonyi and Abia states, and in the north with the Benue states. It shares an international border with the Cameroon Republic in the east and the Atlantic Ocean in the South. The rural areas of the state are predominantly agrarian areas blessed with fertile soil. Farmers in the area grow several crops such as cocoa, plantain, cassava, oil palm, cocoyam, maize, banana, coconut palm, okra, cucumber, and yam.

Sampling Procedure and Data Collection

A three-stage simple random and purposive sampling technique was used to select cocoyam farmers. Three local government areas (LGAs), which are Etung, Ikom and Obubra LGAs, were purposively selected in the first stage due to the significant number of cocoyam farmers in them. In the second stage, two rural communities were randomly selected from each LGAs. A sampling frame of farmers was drawn from the selected communities with the help of the community leaders and the Agricultural Development Project extension agents in the LGAs. In the last stage, fifteen cocoyam farmers were randomly selected from each rural community, making a total of 90 respondents for this study.

The data for this study were collected by the researchers using a structured questionnaire coupled with an interview schedule with the farmers.

Data Analysis

Descriptive statistics, cost and returns analysis, multiple regression, and the Likert rating scale were employed as methods of data analysis. Descriptive statistics such as mean, percentages and frequency distribution were used to describe the socio-economic characteristics of the cocoyam farmers. Cost and return analysis using gross margin analysis, net profits, operating ratio, and return per capital invested were used to assess the profitability of cocoyam production.

Gross margin analysis

Gross margin is a measure of profitability in agriculture when fixed cost such as inherited land is

negligible. It is the difference between total revenue accrued from selling cocoyam produced and the total incurred variable cost in cocoyam production. It is expressed as:

$$\text{Gross margin} = \text{total revenue} - \text{total variable cost}$$

Operating Ratio

An operating ratio is a form of profitability index which measures the proportion of total revenue used as a variable cost. A lower operating ratio implies higher profitability of the ventures and vice versa. It is expressed as.

$$\text{Operating ratio} = \frac{\text{Total variable cost}}{\text{Total revenue}}$$

Return on Capital Invested

Return on capital invested measures profitability in form of a proportion of a unit currency received from a unit currency invested in an enterprise. It is expressed as:

$$\text{Return on capital invested} = \frac{\text{Gross margin}}{\text{Total variable cost}}$$

Multiple Regression Model

Multiple regression is a predictive model used to assess the influence of some explanatory variables on a continuous dependent variable. It was used to investigate the driving factors responsible for cocoyam profitability. It is expressed as:

$$Y_i = \beta_0 + \beta_1 AG + \beta_2 S + \beta_3 EDU + \beta_4 HHS + \beta_5 EXP \\ + \beta_6 FS + \beta_7 FO + \beta_8 CM + \beta_9 FERT \\ + \beta_{10} EXT + \beta_{11} AC + \beta_{12} AI + \varepsilon_i$$

Where,

Y = Gross margin (₦)

AG= Age of household head (Years)

S= Sex (Male=1 or female=0)

EDU = Educational level (years spent in school)

HHS = Household size (Number of people in the household)

EXP = Farming experience (years)

FS = Farm size (hectares)

FO = Farm output (kg)

CM = Cooperative membership (Yes=1 or No=0)

FERT = Quantity of fertilizer (kg)

EXT = Access to extension services (Number of visits in the last farming season)

AC = Access to credit (₦)

AI = Annual income

β_0 = Constant

e = Error term

Likert Type Scale

A five-point Likert type scale was used to identify the constraints faced in cocoyam production. The respondents were asked to rate their challenge on a five-point numerical rating scale. On the scale, 1 = not severe, 2 = moderately severe, 3 = severe, 4 = very severe, and 5 = extremely severe. The mean Likert score of 3.0 was used to group the farmers according to the major challenge they face.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Cocoyam Farmers

The socioeconomic characteristics of the cocoyam farmers were presented in Table 1. The result revealed

that sixty per cent of the cocoyam farmers were male while forty per cent were female. This implies that the majority of the cocoyam farmers were male which could be due to rigorous work involved in the agricultural production process and energy requirements involved in growing root and tuber crops. This is in an agreement with Olukunle (2016) who reported that men are more involved in production at the farm level while women tend to participate more in processing. Also, men remain active in farming activities even in their 60s compared to women. The cocoyam farmer had a mean age of 49.7 years. This suggests that the farmers were advanced in age but still in their economic active age and energetic. This

will greatly affect production positively because subsistence farming needs so much energy for its production. In line with this, Kabir *et al* (2020) reported that age within a productive age shows good labour availability in the production process. The majority (81.1%) of the cocoyam farmers were married, while 12 per cent were widow/widower and 6.7% were single. From the result, it could be seen that the married are more involved in cocoyam production. Farming activities can be more productive when it involves married couples compared to the singles. Various support will be made available from both couples.

Table 1. Socio-economic characteristics of the cocoyam farmers

Socio-economic characteristics	Categories	Frequency	Percentage	mean
Sex	Male	54	60	
	Female	36	40	
Age	≤30	1	1.1	49.7
	31-40	16	17.8	
	41-50	24	26.7	
	51-60	37	41.1	
	≥61	12	13.3	
Marital status	Single	6	6.7	
	Married	73	81.1	
	Widow/widower	11	12.2	
Household size	≤5	24	26.7	7
	6-10	66	73.3	
Educational status	No formal education	6	6.7	
	Primary	65	72.2	
	Secondary	16	17.8	
	Tertiary	2	2.2	
Farm size	<2	59	65.6	1.57
	2-3	27	30	
	>3	4	4.4	
Years of farming experience	≤10	30	33.3	15.64
	11-20	37	41.1	
	21-30	16	17.8	
	≥31	7	7.8	
Membership of cooperative	Yes	49	54.4	
	No	41	45.6	
Annual income (₦)	100,001 - 200,000	17	18.9	310,922.22
	200,001 - 300,000	15	16.7	
	300,001 - 400,000	49	54.4	

	≥400,000	9	10	
Access to extension services	Yes	31	34.4	
	No	59	65.6	
Access to credit facilities	Yes	42	46.7	
	No	48	53.3	

Source: Field survey, 2021

The majority (73.3%) of the respondents had a household size between six and ten persons while 26.7 per cent had a household size below six persons. The mean household size was seven persons. The farmer's productivity level can be affected by the household size of the family either positively or negatively. More labour will influence a greater increase in production while lesser labour will cause a reduction in the production level. The large household size will serve as a readily available source of labour (Mukaila *et al.*, 2020). A greater proportion (72.2%) of the cocoyam farmers had primary school education, 17.8 per cent attained secondary education, 2.2% had tertiary education and 6.7% had no formal education. This implies that the majority of the farmers had formal education, though at a basic level. Their level of education may affect their production level as most innovations require some level of education. Farmers having basic education may, therefore, have a good understanding of innovation and be disposed to certain changes in the farming process. As the farmers spend much time in school, they get more receptive to innovations. A greater proportion (65.6%) of the farmers owned farmland below two hectares while 30% had two to three hectares of farmland and 4.4% owned farmland above three hectares. This implies that the cocoyam farmer was predominantly small-scale farmers who used crude implements such as hoe and cutlass. The size of farmland can greatly affect the production level of a farmer and also the income level.

Regarding farming experience, a larger proportion (41.1%) of the cocoyam farmers had 11-20 years of farming experience, 33.3% had below 10 years of experience, 17.8% had 21-30 years of experience and

7.8% had above 31 years of experience. The mean farming experience of the cocoyam farmers was about sixteen years. This implies that the farmers were experienced in cocoyam production activities as they have been in it for a long time. Years spent in farming operations and allied activities determine the skills and knowledge gained in the venture (Mukaila *et al.*, 2021a). Thus, the farming experience will greatly influence farmers' production level and income as well. Years of farming experience would enhance efficiency in farming (Oluwalana *et al.*, 2019). Above half (54.4%) of the cocoyam farmers belong to a cooperative society where they can enjoy economies of scale and assistance from the government, private sectors or NGOs.

Regarding their annual income, 54.4 per cent of them had between ₦300,000 (USD 730.35) and ₦400,000 (USD 973.80) per annum, 18.9% had ₦100,001 (USD 243.45) to ₦200,000 (USD 486.90), 16.7% had ₦200,001 to ₦300,000 (USD 730.35) and 10% had above ₦400,000 as their annual income. The average annual income of the cocoyam farmers was ₦310,922.22 (USD 756.94). About 34 per cent of the cocoyam farmers had access to extension services, while the majority (65.6%) had no access to extension services. Thus, the majority of the farmers may find it difficult to get relevant information due to low extension contacts. A larger proportion did not have access to credit while only 46.7 per cent of the respondent had access to loans or credit facilities. The few that could access credit got it from informal sources of finance, especially the cooperative society. Credit facilities could be of great help to farmers but most times, small-scale farmers find it difficult to acquire them. Low access to credit facilities could pose a great challenge to the farmer, as it will negatively affect their production

process. Getting access to credit facilities from commercial banks was difficult for the farmers who are smallholder farmers.

Profitability of Cocoyam Production

The profitability level of cocoyam production per hectare of land cultivated in a production cycle was presented in Table 2. The total revenue that farmers generated from cocoyam production per hectare of land in a production season was N231,251.13 (USD 562.98). The total variable cost was N55,428.68 (USD 134.94) out of which the cost of planting materials had the highest share (31.1%) followed by labour cost (22.6%). Boakye-Achampong *et al.* (2017) also reported that labour costs had a high share of the variable cost in cocoyam production. The cost of fertilizer application (manure) accounted for 17.6 per cent of the total variable cost, the cost of herbicides for weed control accounted for 14.6 per cent of the variable cost and transportation cost accounted for 14.2%. Cocoyam production had a gross margin of N175,822.45 (USD 428.04) per hectare of cultivated land. The operating ratio for cocoyam production was 0.24 which implies that twenty-four per cent of the gross revenue was used as operating cost in cocoyam production. The return on capital invested on cocoyam farming was 3.17. This implies that for every unit of currency (N1) invested in cocoyam production, 3.17 units of currency (N3.17 in this case) were gotten as a return. These results imply that cocoyam farming was a profitable venture. Boakye-Achampong *et al.* (2017) and Ogunniyi (2008) also reported that cocoyam production was profitable.

Table 2. Profitability of cocoyam production

	Cost and return items	Amount (₦)
A	Total revenue	231,251.13
	Planting materials	17,239.5
	Herbicides	8,088.00
	Fertilizer application	9,750.00
	Cost of labour	12,505.18
	Transportation cost	7,846.00
B	Total Variable Cost	55,428.68
C	Gross Margin (A-B)	175,822.45
D	Return of capital invested (C/B)	3.17
E	Operating ratio (B/A)	0.24

Source: Field survey, 2021

Drivers of Cocoyam Production Profitability

Table 3 presents the result of multiple regression estimates used to examine the factors that influenced the profitability of cocoyam production. The R-square of 0.618 implies that 61.8 per cent of the variation in cocoyam production profitability was explained by the explanatory variables. The multiple regression model had a good fit as indicated by the f-statistics which was also significant ($p < 0.01$). The significant drivers of cocoyam production profitability were educational status, household size, size of farmland, farm output, cooperative membership, access to credit and annual income.

Table 3. Drivers of cocoyam production profitability

Variables	Coefficients	Std. Error	t-value	Sig.
Constant	50830.93	38287.721	1.328	0.188
Age of farmers	400.4623	302.2532	1.325	0.189
Sex of the farmers	-1873.372	2192.872	-.854	0.396
Education status	9541.119**	4051.327	2.355	0.021
Household size	428.1413**	180.8028	2.368	0.020
Farming experience	-2.405389	265.2152	-.009	0.993
Size of your farmland	3723.130**	1568.575	2.374	0.020
Farm output	2966.918***	742.8443	3.994	0.000
Cooperative membership	6707.035**	2766.683	2.424	0.018
Fertilizer application	-5234.840	4206.452	-1.244	0.217
Access to extension services	336.2032	7838.801	.043	0.966
Access to credit facilities	0.077647***	0.023020	3.373	0.001
Annual income	0.105643**	0.052689	2.005	0.049
R ²	0.618			
Adjusted R ²	0.527			
f-statistics	8.74			
p-value	0.0000			

*** Significant at 1%, ** at 5% level, * at 10%

Source: Field survey, 2021

The coefficient of farmers' educational level was positive and significant in relation to cocoyam production profitability ($p < 0.05$). This implies that an increase in years spent in school would increase cocoyam production profitability. Thus, an educated cocoyam farmer would make more profit than the uneducated ones. This could be because the level of education enhances farmers' adoption of modern farming practices. Education also enhances farmers' decision-making process on the best farming practices (Mukaila *et al.*, 2021b). Better decision-making would lead to a high level of productivity and consequently enhance profitability. Tanko and Alidu (2017) reported a similar finding that education increase profit efficiency in yam production.

Household size was also positive and significant in relation to cocoyam production profitability ($p < 0.05$). This suggests that an increase in household size will enhance cocoyam production profitability. Thus, a

household with a large number of people will have a higher profit while households with a low household size will make a lower profit in cocoyam production. This is because household size serves as a source of cheap family labour in agricultural production (Mukaila *et al.*, 2020). Considering the importance of labour in agriculture and the cost related to it, a household with a large household size will cultivate more land and will not spend money to hire labour in their production activities which, in turn, leads to more income (Mukaila *et al.*, 2021b). Family labour would reduce the cost of production in cocoyam and consequently increase the profitability level. This supports the report of Ogunniyi (2008) that family size reduces loss in cocoyam production.

The size of farmland positively and significantly influenced the profitability of cocoyam production ($p < 0.05$). This implies that a unit increase in farm size would result in a proportionate increase in the profitability of cocoyam production. This is because an increase in the

hectares of farmland under cultivation will increase the output level of the production and consequently, would increase the profit made in cocoyam production. Large farm size also allows the farmers to buy inputs in bulk at a cheaper rate; thus, large farmland allows the enjoyment of economies of scale. Thus, a farmer with a large farm size under cultivation would make more profit than those with a small farm size, *ceteris paribus*. Ariyo *et al.* (2020) also reported that an increase in farm size increased the profitability of yam production.

Farm output had a positive and significant effect in relation to cocoyam production profitability ($p < 0.01$). This implies that the higher the cocoyam output, the higher the profitability. This is not surprising as farmers' profits depend on farm output. A farmer that has a high output per hectare of land cultivated would have higher profitability than those with a low output.

Cooperative membership also positively and significantly influenced cocoyam production profitability ($p < 0.05$). The probability of being a member of a cooperative society by the farmers increases the profitability level of cocoyam production. Being a member of a cooperative association also increases the profit efficiency of farmers (Jonah *et al.*, 2020). The cooperative society serves as means of access to information for the farmers, access to credit facilities, access to the market and educating the members about innovation in agriculture. Members of the cooperative society also enjoy economies of scale in their production activities. These will, in turn, increase cooperative members' profitability in cocoyam production.

Access to credit positively and significantly influenced cocoyam production profitability ($p < 0.01$). An increase in the likelihood of farmers' access to credit facilities would increase cocoyam production profitability. Capital, which is not always enough, is an important part of agricultural production. Thus, farmers who have external financing sources would be able to invest more in their production activities than those

without external financing sources. High investment in cocoyam production would lead to high output, as a result of the enjoyment of economies of scale, which would consequently result in more profits in cocoyam production. Jonah *et al.* (2020) also reported that access to credit increased profit efficiency.

Annual income was positive and significant in relation to cocoyam production profitability ($p < 0.05$). This implies that an increase in annual income will increase the profitability of cocoyam production. This is because farmers' income serves as capital used in cocoyam production activities. Thus, a farmer with a high level of income in the previous year would have more money to invest in the present year while those with low income will have little capital to invest with. A higher level of investment in cocoyam production will, in turn, enhance the profitability of cocoyam production.

Constraints Faced in Cocoyam Production

Table 4 presents the challenges faced by cocoyam farmers in cocoyam production. Cocoyam farmers were faced with many challenges which have affected the performance of their cocoyam production. The identified severe constraints affecting cocoyam production were lack of government support ($\bar{x} = 3.91$), high cost of inputs such as planting materials, fertilizers, herbicides and pesticides ($\bar{x} = 3.58$), inadequate access to credit facilities ($\bar{x} = 3.52$), poor market price ($\bar{x} = 3.48$), inadequate storage facilities ($\bar{x} = 3.47$), restriction on land usage by land tenure system ($\bar{x} = 3.43$), inadequate extension contact ($\bar{x} = 3.41$), lack of improved varieties of cocoyam ($\bar{x} = 3.39$), low research on cocoyam ($\bar{x} = 3.32$), incidences of pest and diseases ($\bar{x} = 3.25$), and post-harvest or on-farm losses ($\bar{x} = 3.23$). While poor road network to transport produce ($\bar{x} = 2.94$), and high cost of hired labour ($\bar{x} = 2.64\%$) were not severe constraints in cocoyam production.

Table 4. Constraints faced in cocoyam production

Challenges	Mean	Decision	Rank
Lack of government support	3.91	Severe	1 st
High cost of inputs such as fertilizers, herbicides and pesticide	3.58	Severe	2 nd
Inadequate access to credit facilities	3.52	Severe	3 rd
Poor market price	3.48	Severe	4 th
Inadequate storage facilities	3.47	Severe	5 th
Restriction on land usage by the land tenure system	3.43	Severe	6 th
Inadequate extension contacts	3.41	Severe	7 th
Lack of improved variety of cocoyam	3.39	Severe	8 th
Low research on cocoyam	3.32	Severe	9 th
Incidences of pest and diseases	3.25	Severe	10 th
Post-harvest or on-farm losses	3.23	Severe	11 th
The poor road network to transport produce	2.94	Not severe	12 th
High cost of hired labour	2.64	Not severe	13 th

Source: Field survey, 2021

Poor government supports in terms of the provision of modern production equipment which will reduce the cost of production, and increase output and profits. Due to the lack of government support, the farmers spent high on the cocoyam production inputs such as herbicides to control weeds, pesticides to control pests, fertilizers to enhance soil nutrients and planting materials for growing cocoyam. These increased their cost of production and consequently reduced cocoyam profitability. Inadequate access to credit facilities hindered cocoyam production activities as the farmers' income was not enough to expand their production (as stated by the farmers). This limits their production to a small-scale venture. In line with this, Philip *et al.* (2009) stated that the lack of agricultural credit is a severe constraint in agriculture in Nigeria. The lack of improved variety of cocoyam and low research on cocoyam limits most cocoyam farmers to the use of low-quality variety for planting. Due to the perishable nature of cocoyam and other agricultural products, inadequate modern storage facilities were a severe constraint to the farmers. Cocoyam farmers were unable to store their products for a long period which

forced them to sell their products at a cheaper rate during the production season. Farmers would have stored their products for the offseason if there are adequate storage facilities. Obetta *et al* (2020) also reported that rapid deterioration as a result of poor storage facilities also hinders agricultural activities.

Some farmers were unable to increase their production due to the land tenure system which gave the state governments ownership of land with little percentage ownership to the farmers. This limits most farmers to cultivate small farmland. Most farmers lack access to relevant information due to inadequate extension services. This could make the farmers practice cocoyam production in a traditional way instead of a more profitable modern method. It could also affect their access to timely market information. Extension workers can play a significant role in disseminating market information to farmers. These could directly or indirectly reduce their profits. The incidence of pests and diseases also affected cocoyam production severely. This could be due to the high cost of pesticides to control them which resulted in low output and consequently low profits. Omotesho *et al.*

(2020) also reported that the incidence of pests and disease was a severe constraint in cocoyam production. Due to poor storage facilities, post-harvest loss was a constraint to cocoyam production. The post-harvest loss led to poor output and profit. The poor market price was also perceived as a major constraint in cocoyam production. This could be due to a lack of storage facilities which forced the farmers to sell at a lower price to avoid crop spoilage. Poor infrastructure such as poor road networks affected farmers' movement to and from the farm and the movement of their products to the markets. The poor road network makes the farmers spend high on transportation. The high cost of hired labour was ranked last among the constraints which could be due to the large household size which was used as cheap family labour in cocoyam production.

CONCLUSION

This study investigated cocoyam production profitability, its determinants and constraints among smallholder farmers in Cross River State, Nigeria. This study has shown that cocoyam production was a profitable enterprise with a low operating ratio and a high investment return. The driving factors of cocoyam production profitability were educational status, household size, size of farmland, farm output, cooperative membership, access to credit and annual income. These factors enhanced the profitability of cocoyam production. Although cocoyam production was profitable, some militating factors are limiting its production. The severe constraints affecting cocoyam production were lack of government support, high cost of inputs (planting materials, fertilizers, herbicides and pesticides), inadequate access to credit facilities, poor market price, inadequate storage facilities, restriction on land usage by land tenure system, inadequate extension contact, lack of improving varieties of cocoyam, low research on cocoyam, incidences of pest and diseases, and post-

harvest or on-farm losses. There is a need to address these constraints for a more profitable cocoyam production at a large scale and to attain food security.

Thus, this study recommends that government should give adequate support to the cocoyam farmers. The support could be informed of financial assistance such as credit at a no or low-interest rate or grants to the farmers. Cocoyam farmers on their part can pool resources to form a cooperative society for the betterment of their members (accessing credits, market information and enjoyment of economies of scale). The provision of free modern farm inputs or at a subsidized rate by the government is also required to encourage more participation in cocoyam farming and to increase profitability. This will provide adequate and timely farm inputs for farmers as this will enable the farmers to increase efficiency, output and income at large. Facilitation of marketing linkage for the cocoyam farmers with the consumers by the extension agents is also needed to enhance the marketability of cocoyam. Farmers should be given more access to farmland to increase their production by the government.

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ربحية إنتاج كوكويام ومحدداته في ولاية كروس ريفر، نيجيريا

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ملخص

يمكن للمحاصيل المهمة أو التي قل استخدامها أن تلعب دورًا حيويًا في تحقيق الأمن الغذائي بدلًا من بعض المحاصيل غير التقليدية التي ارتفعت أسعارها في الاعوام القليلة الماضية لأن العودة لزراعة المحاصيل التقليدية وتوضيح مقدار ربحيتها للمزارعين سوف يزيد من إقبال المزارعين على زراعتها. لذلك، جاءت هذه الدراسة لتحديد ربحية إنتاج محصول كوكويام انتاج كوكويام، والعوامل المسؤولة عنها، والقيود التي تواجه إنتاج كوكويام في ولاية كروس ريفر، نيجيريا. تم تحليل البيانات التي تم جمعها باستخدام الاستبيانات مع الإحصاءات الوصفية، وتحليل التكلفة والعائد، والانحدار المتعدد ومقياس ليكرت الخماسي. أظهرت النتائج أن غالبية مزارعي الكوكويام هم من الذكور، المتزوجين في أوج نشاطهم الاقتصادي ويعملون على نطاق صغير. كان إنتاج كوكويام مربحًا حيث كان لدى المزارعين هامش إجمالي قدره 175، 822.45 N (428.04 دولارًا أمريكيًا) لكل هكتار من الأراضي المزروعة، بمعدل تشغيل يبلغ 0.24 وعائد على رأس المال المستثمر يبلغ 3.17. كانت العوامل التي أثرت على ربحية إنتاج الكوكويام هي التعليم، وحجم الأسرة، وحجم المزرعة، وإنتاج المزرعة، والعضوية التعاونية، والحصول على التمويل والدخل السنوي. كانت المعوقات الرئيسية التي واجهها إنتاج الكوكويام هي عدم كفاية، وضعف الدعم الحكومي، وارتفاع تكلفة المدخلات، وضعف مرافق التخزين. لتعزيز ربحية إنتاج كوكويام، توصي الدراسة بتوفير المدخلات الزراعية والدعم المالي في شكل قروض أو منح للمزارعين. حيث يؤدي التمويل إلى زيادة أرباحهم وزيادة الإنتاج مما يزيد من توفير الغذاء، وبالتالي يقلل من مشكلة انعدام الأمن الغذائي.

الكلمات الدالة: زراعة الكوكويام، الأمن الغذائي، الربحية، المحاصيل المهمة وغير المستغلة، الزراعة.