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RESOURCE USE EFFICIENCY AND PROFITABILITY OF COCOA PRODUCTION IN IFE SOUTH LOCAL GOVERNMENT AREA, OSUN STATE

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ABSTRACT

This study assessed resource use efficiency among cocoa farmers in Ife south local government area, Osun State. Two stage random sampling procedure was used for selection of the sample population. The first stage involved the random selection of four (4) districts areas; (Ifetedo, Oke-Owena, Olode and Kere) out of the eight (8) districts in Ife South due to high cocoa production. Second stage involved random selection of thirty (30) cocoa farmers from each district to make a total of 120 cocoa farmers as the population sample. Data were collected through the use of a well-structured questionnaire. Data collected were subjected to both descriptive and inferential statistical analysis a well as profitability index. Results showed that the mean age of the cocoa farmer was 51.73 and majority (87.50 %) of them was male. Majority (69.2%) of the cocoa farmer's acquired land through purchase/rent. The result also showed that most (71.7%) of the cocoa farmers in the study area used their family/friend as their source of labor. The benefit cost ratio (BCR) of cocoa production was 2.98 which imply that for every ₦1 invested, there would be return of ₦1.98, and this indicates that cocoa production was profitable in the study area. The study showed that fertilizer and chemicals were under-utilized while labour and land were over utilized. The regression analysis showed R^2 of 0.639 indicates that the explanatory variable explained 63.90% of the total variation in the dependent variables. The study deduced that cocoa production in the study area has proved to be a profitable enterprise to invest on. The study recommends that the government should provide grants and credit facilities for the cocoa farmers while effort should be spared to subsidize the cost of fertilizer and chemicals among the farmers in the study area.

Keyword: Cocoa farmers, Resource-use, Profitability index, Benefit-cost-ratio, Osun State

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INTRODUCTION

Agriculture is an important sector of the Nigerian economy. It contributed approximately 22% to the GDP of Nigeria in the first quarter of 2020 and 26.84% in 2022 (National bureau of Statistics NBS 2022a). More than 80% of Nigeria's farmers are smallholder farmers who account for 90% of the country's agricultural output (Oyaniran, 2022). The sector is confronted by several challenges, such as climate change, poor finance, violent conflict, a low level of irrigation farming, technological underdevelopment, violent crimes (farmers' herder conflict and abduction), poor land tenure systems, among others (Food and Agricultural Organisation, 2019). Sertoğlu *et*

al (2017) opined that the growth in the overall economy of a nation depends on the development of agricultural sector. It is the Nation's powerhouse, providing over 85% of the country's foreign exchange earnings with abundance of cheap food for its populace (Nwankpa, 2017).

In respect to export, Nigeria's economy depends heavily on the production of Cocoa (Afolayan, 2020). Nigeria's top agricultural export is cocoa, and it ranks as the fourth-largest cocoa producer in the world (Abdullahi *et al.*, 2021). In the 1950s and 1960s, cocoa was Nigeria's main export and source of foreign exchange. The nation was the world's second-largest producer in 1970. When the railway from Lagos was built in 1906, Osogbo was transformed into an important hub for collecting cocoa produced in the neighborhood. Fast-growing in tropical forests, cocoa can be grown alongside other trees to produce additional products like timber, firewood, fruits, building materials, honey, resin, medicine, and materials for ceremonial rituals (Gama et al., 2021). Cocoa is of significant economic importance for producing and consuming countries. It is vital in generating export revenues, income, and employment (Shahanas *et al*., 2019). In 2021, Nigeria exported cocoa beans worth N209.89 billion to the international markets, which translated into 41.6 per cent of the total export earnings, the second after crude oil, as reported by the National Bureau of Statistics (National Bureau of Statistics, 2022).

The profitability of cocoa farmers cannot solely depend on farmer supply sales; it also depends on how effectively and efficiently resources are used. The prospect of farms obtaining a specific optimal level of output from a given bundle of resources or a specific level of output at least cost is typically related to allocate efficiency analysis (Obike *et al.*, 2016). Allocative efficiency refers to how effectively farmers allocate resources in a way that inputs are utilized up to the point at which their marginal contribution value equals the cost of the factor of production. It is described as selecting the best input proportions based on comparable prices.

Low yields are often attributed to inefficient production methods, which include labor-intensive agricultural equipment, technical and allocative inefficiencies, overreliance on household resources, and rapidly falling soil fertility. The efficiency of smallholder resources at the farm level has significant effects on how a nation's agriculture develops. Farms that are efficient utilize resources more effectively and produce yield from the least number of resources (Sunday *et al.*, 2014). Both researchers and policymakers agree on the critical role that efficiency plays in raising agricultural productivity which is typical of cocoa production in Nigeria. The productivity and resource usage efficiency of the poor must improve in order to raise their income. Therefore, increasing productivity would be a deciding element in increasing individual incomes and development dynamics.

Economic growth will be significantly impacted by increasing the productivity of cocoa production depending on the effectiveness of their resource utilization. As a result, the study tries to assess resource use efficiency among cocoa farmers in Ife South Local Government Area of Osun State, its conclusions and suggestions will offer an empirical backdrop to the resource-use effectiveness and profitability of cocoa production, which will aid farmers in increasing their output and revenue. It will also support decision-makers in developing policies that can directly boost farmers' productivity in the production of cocoa.

METHODOLOGY

Study area, sampling techniques and sample size

This study was carried out in Ife South LGA, Osun state**.** The population of the study comprise of cocoa farmers in Ife South LGA, Osun state. The Headquarter of Ife South LGA is Ifetedo. Two stage sampling procedure was used in selecting the sample population. The first stage involved the purposive selection of four (4) (Ifetedo, Oke-Owena, Olode and Kere) out of the eight (8) districts in Ife South due to high cocoa production, this constitutes 50% of the total area. Second stage involved random selection of thirty (30) cocoa farmers from each district to make a total of 120 cocoa farmers as the population sample. Primary data were collected through the use of a well-structured questionnaire. The questionnaire was structured to provide necessary information on socio economic characteristics of the cocoa farmers, costs and returns of coca production and resource type and use efficiency.

Analytical technique and model specification

Profitability index

Profitability index was determined using three measures of profitability analysis to determine the profitability of cocoa production these include: Cost and Return Analysis (Ti), Gross Margin (GM) and Benefit-Cost Ratio

$$\text{(BCR). BCR} = \frac{\text{Total Revenue (Benefit)}}{\text{Total Cost}} \quad (1)$$

Investment criteria require that BCR should be greater than one (BCR> 1) before a business can be termed profitable. Also, enterprise budgetary analytical approach was used to estimate cost and return of cocoa production to be able to know the net profit of the farmers.

$$\text{Profit} = \text{Total Revenue} - \text{Total Variable Cost}$$

Mathematically, $\pi = \text{TR} - \text{TFC} + \text{TVC}$ (2)

Where π denotes Profit;

TR is Total Revenue (amount realized from the enterprise);

TFC is Total Fixed Cost (expenditure incurred on fixed assets used in production) and

TVC is the Total Variable Cost (cost incurred during production).

Depreciation was calculated using straight line method

$$\text{D} = \frac{(Cost\ of\ the\ asset - Estimated\ salvage\ value)}{Estimated\ useful\ life\ of\ an\ asset} \quad (3)$$

The Gross Margin (GM) equation is given as: $\text{GM} = \text{TR} - \text{TVC} = \text{P} \times \text{Q} - \text{TVC}$, (4)

where: GM = Gross Margin (in Naira),

Q = quantity of cocoa produced (kg), P = Price per kg (in Naira).

Resource-use efficiency

Efficiency of resource use was determined by the ratio of marginal value product (MVP) to marginal factor cost (MFC) of inputs based on the estimated regression coefficients. Efficiency of resource, r, is given as the value of output was estimated as specified in equation 1 as exponential function.

The marginal value product (MVP) of resource provides a framework for policy decision on resource adjustment. When the MVP value is positive, it is an indication that output could be increased by using more of the given factor input. However, the magnitude of the MVP has to be compared with acquisition price which is the marginal factor cost (MFC) of the input in order to determine how useful it is to increase the level of the factor used. The divergence between the acquisition price of the input and its MVP indicates the scope of resource adjustment necessary to attain economic optimum. A given resource is optimally allocated when there is no divergence between its MVP and the MFC of the resource input. That is:

$AMPP_{xi} = b_i Y = MVP_{xi}$(exponential function)
$MVP_{xi} = P_{xi}$ Where: $MVP_{xi} = Marginal\ Value\ Product\ of\ input\ x_i$ (5)
$P_{xi} = Price\ of\ input\ x_i = MFC$

A t-test statistic is used to determine if there is divergence between MVP and MFC. The acquisition price or MFC for all resources used is the average market price prevailing in the area. However, where resources are measured in value terms, efficiency in the use of resources must be evaluated by equating their MVP to one Naira plus interest rate.

The elasticity of production indicates the changes in output relative to a unit change in input of other levels that are held constant. Mathematically, the elasticity of production is expressed:

$$E_p = \frac{\delta y}{\delta x}.\ \frac{x}{y} \quad (6)$$

Where y = aggregate value of output,
x = resource input and $\frac{\delta y}{\delta x} =$ derivatives of y with respect to x $and\ y$

$$\text{Elasticity of production} = EY_{xi} = b_{xi}(\text{exponential function}) \quad (7)$$

According to theory, when the ratio is greater than one, production is elastic and the rate of output growth exceeds the rate of input growth. If it is less than 1, the production is said to be inelastic since the percentage increase in output is less than the percentage increase in input. When the ratio is one, elasticity is said to be unitary since output grows at the same rate as input.

Model specification

Only three significant categories of explanatory variables were taken into account in this study when modeling the production function for cocoa production. According to Balogun and Obi-Egbedi (2012), land, quality and quantity of durable inputs (cutlass, harvesting pole, sprayer, basket, and other tools), and quantity and quality of non-durable inputs (fertilizer, agrochemicals, and labor) are the three inputs most important in explaining variation in cocoa output in the study area.

The model is specified as:

$$Y_i = \beta_0 + \beta_1 x_i + \beta_2 x_2 + \beta_3 x_3 \ \ldots + \beta_7 x_7 + \mu_i \quad (8)$$

Where: Yi = Gross margin of cocoa (₦)
X_1 = Household size (persons)
X_2 = Farming experience (years)
X_3 = Farm size
X_4 = Labour type
X_5 = Labour cost (₦)
X_6 = Costs of durable input (₦)
X_7 = Costs of non-durable input (₦)
$B_1 – \beta_5$ = coefficients of parameters estimated
β_0 = Intercept and μ_i= error term

RESULT AND DISCUSSION

Socio economic characteristics

Table 1 showed Socio economic characteristics of cocoa farmers in the study area. Age of respondents according to table 1 revealed that a certain percentage (43.3) of the cocoa farmer was between the ages of 51 and 60 years and some (39.2%) were below 40 years of age. On an average, the ages of the respondents were 52years. This implies that the farmers are still productive and may be able to make useful decisions capable of optimizing available resources for increased productivity. This is consistent with the study of Obike *et al.,* (2016), Akinniran and Taiwo (2016) and Oladoyin and Aturamu (2022).

The result further revealed that about (38.3%) of the respondents had between 7 and 9 persons in their household size, some (30.0%) of them had between 4 and 6 persons, few (27.5%) of them had between 10 and 12 persons while just (4.2%) of them had between 1 and 3 persons as their household size. The mean household size of the cocoa farmers was 7 persons. This implies that the farmers have a fairly large household size which could probably serve as insurance against shortfalls in the supply of farm labour, this conforms with Obike *et al.,* (2016) who opine that household size plays a great role in farm labour provision in the agricultural sector.

Education level of coca farmers in the study area showed that, few (21%) of the cocoa farmers had no formal education while majority (79%) of them had formal education ranging from primary to tertiary education. This implies that, they will be able to make judicious use of available resources and adopt any form of innovation brought to them that has positive effect on their farming activity this is inconformity with the finding of Akinniran and Taiwo, 2016.

About (36.7%) of the respondents had between 6 and 10years of cocoa farming experience, some (22.5%) of them had between 16 and 20years, while just (8.3%) of them had over 26years of experience in cocoa production. On an average, the cocoa farming experience of the respondents was 14years. Generally, it would appear that up to a certain number of years, the farming experience would have a positive effect; after that, the effect may become negative. The negative effect may be derived from ageing or reluctance to change from old and familiar farm practices

and techniques to those that are modern and improved. The result is in line with result of Obike *et al.,* (2016) and Oladoyin and Aturamu (2022).

Table 1: Socioeconomic characteristics of cocoa farmers

Age	**Frequency**	**Percentage**
<31	5	4.2
31-40	7	5.8
41-50	35	29.2
51-60	52	43.3
>61	21	17.5
Total	**120**	**100.0**
Mean ± SD = 51.73 ± 9.497		
Household size (persons)	**Frequency**	**Percentage**
1-3	5	4.2
4-6	36	30.0
7-9	46	38.3
10-12	33	27.5
Total	**120**	**100.0**
Mean ± SD = 7.49 ± 2.094		
Education level	**Frequency**	**Percentage**
No formal	26	21.7
Primary	12	10.0
Secondary	67	55.8
Tertiary	15	12.5
Total	**120**	**100.0**
Cocoa farming experience	**Frequency**	**Percentage**
1-5	12	10.0
6-10	44	36.7
11-15	16	13.3
16-20	27	22.5
21-25	11	9.2
>26	10	8.3
Total	**120**	**100.0**
Mean ± SD = 14.39 ± 7.774		
Cocoa farm size	**Frequency**	**Percentage**
1-6	51	42.5
6-11	51	42.5
16-21	2	1.7
>21	16	13.3
Total	**120**	**100.0**
Mean ± SD = 9.00 ± 7.664		

Source of land	**Frequency**	**Percentage**
Inheritance	37	30.8
Purchase/rent	83	69.2
Total	120	100.0
Source of labour	**Frequency**	**Percentage**
Hired	30	25.0
Family	2	1.7
Family/friend	86	71.7
Causal	2	1.7
Total	**120**	**100.0**

Source: Field survey, 2023

About (42.5 %) of the respondents had either between 1 and 6acres of land and 6 & 11 acres of land, some (13.3 %) of them had over 21acres while just (1.7 %) of them had between 16 and 21acres of land. The mean farm size of the cocoa farmers in the study area was 9 acres. The result showed that the farmers have considerable access to farm land for cocoa farming. This is consistent with Oladoyin and Aturamu (2022) findings. The result also showed that, majority (69.2 %) of the cocoa farmers acquired land through purchase/rent while some (30.8 %) of them acquired land through inheritance. The result according to cocoa farmers s source of labour revealed that, most (71.7 %) of the cocoa farmers in the study area used their family/friend as their source of labor, about (25.0 %) of them hired their labour while just (1.7 %) of them either used family or casual source of labor. Family labour is the major source of labour used by the cocoa farmers.

Profitability of cocoa production

Table 2 showed costs and returns to cocoa production in the study area. The mean TR of cocoa production in the study area was valued at ₦151194.3 which consists of mean value of sold, consumed and gifted out cocoa. TC consists of TVC and TFC. Total variable costs accounted for 76.1percent of the total costs with a mean value of ₦38560.28 which consists of planting material cost (40.0 %), labor cost (15.3 %), fertilizer cost (12.2 %), transportation cost (5.9 %) and chemical cost (2.6 %). TFC after depreciation formed 23.9 percent of the total cost with a mean value of ₦12134.2 which was made up of cutlass (7.6 %), harvesters (6.6 %), bags (6.4 %) and sprayers (3.3 %). The total cost of cocoa production was ₦50694.5; GM was ₦112634; net farm income NFI was ₦100499.8. The BCR of cocoa production was 2.98 which imply that for every ₦1 invested, would return ₦1.98, and this indicates that cocoa production was profitable in the study area. This is consistent with the findings of Emokaro and Adelakun (2015), Adefemi (2019) and Oladoyin and Atauramu (2022).

Table 2: Costs and returns analysis to cocoa production

Item	Average quantity	Average cost	Mean (₦)	%TC
Revenue (kg)				
Sold	81.9	1772.5	145167.8	
Consume	1	1772.5	1772.5	
Gift	2.4	1772.5	4254	
Total revenue			151194.3	
Variable cost				
Labour cost			7773.333	15.3
Chemical cost			1307.211	2.6
Fertilizer cost			6181.073	12.2
Transportation cost			3015.778	5.9
Planting material cost			20282.89	40.0
Total variable cost (TVC)			38560.28	76.1
Fixed cost				
Cutlass			3868.8	7.6
Hoes			1681.2	3.3
Bags			3250.9	6.4
Others			3333.3	6.6
Total fixed cost (TFC) after depreciation			12134.2	23.9
Total cost (TC)			50694.5	100.0
Gross margin (GM) (TR-TVC)			112634	
Net farm income (NFI) (GM-TFC)			100499.8	
BCR (TR/TC)			2.98246	

Source: Data analysis, 2023

Resource use efficiency of cocoa production

Table 3 showed the resource (Labour, chemical and fertilizer) use efficiency. The results showed the ratio of the marginal value product (MVP) to the marginal factor cost (MFC) for labors, chemical and fertilizer (r=1.569) and fertilizer (r=1.659) were under-utilized, meaning that farmers would earn higher returns from their production if they increase the use of these inputs while holding other inputs constant. Labor (r=0.574) was over-utilized, implying that a decrease in this input would, holding other input constant, increase the productivity level. Consistently, Obike *et al*., (2016) and Nicodeme and Suqun (2017) reported over utilization of labour among cocoa farmers in their study area.

Table 3: Resource use efficiency of inputs (Labor, chemical and fertilizer)

Variables	MPP	MVP (MPP*Py)	MFC(Px)	MVP/MFC=r	Efficiency level
Labour	0.712	1262.02	2200	0.574	Over utilized
Chemical	0.432	765.72	488.1356	1.569	Under utilized
Fertilizer	0.582	1031.595	621.7647	1.659	Under utilized

Source: Data analysis, 2023

Determinants of cocoa production

The result showed a R^2 value is 0.639 which indicates that the explanatory variables explained 63.9% of the total variation in the dependent variables implying a good fit. The result showed that, farm size (β=0.047, p=0.000) and labor cost (β=0.550, p=0.000) are positive and significant at 1% level, this implies that a unit increase in farm size and labour cost will result in 0.047 and 0.550 unit increase in gross margin of the cocoa farmers respectively. This indicates that, the larger the farm size of cocoa farms, the higher their income to the farmer. Labour cost may be have expected to have an inverse relationship with the gross margin, however its positive influence may be as a result of well optimized and efficient family labour input resulting in more output. Oladoyin and Ataramu (2022) also reported a significant relationship between labour and cocoa profitability.

Cost of durable input (β=0.373, p=0.008) and cost of non-durable input (β=0.672, p=0.000) are negative and significant at 1 % level to gross margin of cocoa production. This implies that a unit increase in cost of durable and non-durable inputs will result in 0.373 and 0.672unit decrease in gross margin of the cocoa farmers respectively. This is expected as variable cost and fixed costs are expected to have a negative relationship with gross margin of the cocoa farmers.

Table 4: Regression Analysis on determinants of cocoa production

Variables	B	Std. Error	T	Sig.
Constant	15.671	1.834	8.547	0.000**
Household size	0.033	0.033	0.996	0.322
Farming experience	-0.002	0.007	-0.311	0.757
Farm size	0.047	0.008	5.590	0.000**
Labour type	0.025	0.068	0.364	0.717
Labour cost	0.550	0.127	4.326	0.000**
Cost of durable input	-0.373	0.137	-2.714	0.008**
Cost of non-durable input	-0.672	0.080	-8.393	0.000**
R^2	0.639			
R^{-2}	0.615			
F-value	26.052**			

*Significance at 5% and **Significance at 1%. Dependent variable: Gross margin(₦)

Source: Data analysis, 2023

CONCLUSION AND RECOMMENDATIONS

This study revealed that the cocoa farmers are in their productive active age and that education level is relatively high maybe due to the presence of high institution such as Obafemi Awolowo University, Oduduwa University etc. in the study area. The mean household size was 7 persons who served family labour for the farming. The farmers had mean farm size of 9acres. Cocoa production is profitable and lucrative in the study area. Furthermore, the need arises for adjustment in the level of resource use most especially with regards to reduction in the number of man-days and increases quantity of chemical and fertilizer utilized by cocoa farmers in the study area with all other inputs unchanged. Ultimately, farm size, labour cost, cost of durable and non-durable input were major determinants of cocoa production in the study area.

Improvement in the farmer usage of fertilizers and chemicals (such as herbicides and pesticides) to enhance resource use efficiency. Also, emphasis should be placed on training and exposure to

modern technology to guarantee efficient use of resources while there should be an improvement in the farmers' access to extension services study facilities to enhance their resource use efficiency.

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