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ASSESSMENT OF FARM RESOURCES USE BY SMALL SCALE FARMERS FOR COCOA PRODUCTION IN BOKI LOCAL GOVERNMENT AREA, CROSS RIVER STATE, NIGERIA

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ABSTRACT

This study analysed farm resources use by cocoa farmers for cocoa production in Boki Local Government Area, Cross River State, Nigeria. Given the importance of farm resources in cocoa sector, there has been limited research on how small scale farmers in Boki LGA utilise these farm inputs for cocoa production. This study assessed this gap with a view to determine the resources that influence cocoa production in the area. The socioeconomic characteristics of the cocoa farmers were described, farm resources such as farm size, labour, cocoa seedlings, farm capital, farm credit and other farm constraints affecting cocoa output in the area were investigated. A multi-stage sampling technique was used to select 125 small-scale cocoa farmers for the study. The data collected were analyzed using descriptive statistics, regression analysis, and Likert-type scale ratings. The study revealed a predominantly maledominated cocoa farming sector (72.8%), reflecting cultural norms and the physical demands of the production process. The majority of farmers (65.6%) were married, highlighting their reliance on household labour. Educationally, 64% attended higher education institutions, facilitating the adoption of advanced farming techniques. The average experience of the farmers was 17 years, with 33.6% having more than 20 years of cocoa farming experience. Regression analysis showed that farm size, farm capital, and cocoa seedlings positively affected cocoa output, whereas labour and farm credit negatively affected production, suggesting inefficiencies in labour utilization and lack of credit use. The key constraints identified were inadequate improved cocoa varieties, inadequate storage facilities, and high input costs. The study concluded that the effective management of farm productive resources was crucial for enhancing cocoa productivity. The study recommended many more female participation in cocoa farming, strengthening cooperatives activities, investing in improved cocoa varieties and storage facilities and expanding extension services to help improve the productivity and sustainability of cocoa farming in the region.

Keywords – Assessment, Farm resources, Cocoa production, Small-scale farmers.

INTRODUCTION

Agriculture is one of the major sectors of the Nigerian economy that contributes significantly to labour employment and overall economic development. According to statistics, the agricultural sector accounts for approximately 38% of total employment in Nigeria (Statista, 2022), underscoring its importance as a primary source of livelihood for millions of Nigerians. (Ojo et al., 2018; Waliu and Akinmola, 2022; Oniah and Edem, 2023) Despite the many challenges which have hindered its productivity and overall economic impact, the sector's potential for revitalization and growth is still crucial for the country's future economic prospects. This assertion was supported by Nwogwugwu et al. (2023), who emphasized that despite the challenges faced by the sector, its revitalization is essential for sustainable development and poverty reduction, particularly among smallholder farmers who utilize traditional farming methods. As documented by Adeite and Adedotun (2022), agriculture remains the foundation of Nigeria's economy, serving as a major driver of economic growth, and generating millions of jobs.

Cocoa production has long been a cornerstone of Nigeria's agricultural sector, contributing significantly to both the national income and livelihoods of millions of small-scale farmers. It is important to the Nigerian economy, as it is the leading agricultural export of the country and is currently the world's fourth largest producer of cocoa, after the Ivory Coast, Indonesia, and Ghana, with 280,000 metric tonnes of cocoa (Josephine and Feyishola, 2023). Historically, cocoa crops were the major foreign exchange earners for Nigeria in the 1950s, 1960s, and the 1970s and were the second largest producer in the world (Oni, 2020). However, following the discovery and exploitation of oil, its significance share of world output has diminished. Recent statistics indicate that cocoa production in Nigeria contributes approximately 2% to the Gross Domestic Product (GDP), despite having recorded increased earnings by 279% (https://nairametrics.com). It is expected that cocoa will continue to dominate as one of the leading agricultural exports, as renewed efforts in recent years have aimed to revitalize the sector.

In Cross River state, particularly in Boki Local Government Area (LGA), cocoa farming is a vital source of livelihood for small-scale farmers. The region's vast arable land and favourable climatic conditions make it an ideal location for cocoa production. However, despite favourable conditions, small-scale farmers in the area continue to face challenges of low productivity and economic instability. Despite efforts to promote sustainable cocoa farming practices, these challenges persist. This underperforming state of the sector could be attributed to various challenges relating to farm productive resources such as labour availability, farm size, improved cocoa seedlings, farm credit, and farm capital.

Empirical studies have shown that farm resources such as farm size, labour, and improved varieties crop varieties and seedlings are significant determinants of agricultural productivity (Awunyo-Vitor et al., 2016; Buhari et al., 2018; Ndubueze-Ogaraku et al., 2021; Oyibo et al., 2021; Oniah and Edem, 2022). However, in the Boki LGA, many of the cocoa farmers farm on small plots of land ranging between 0.1 – 2.0 hectares which may limit their ability to achieve economies of scale and could increase their cost per unit of production. More so, the cocoa farmers may still be relying on old or low-yielding cocoa trees given their limited access to improved seedlings and extension services that could guide them in adopting better agronomic practices. This situation may further be compounded by numerous challenges, including inadequate access to farm capital and credit facilities, which may restrict the farmers' ability to invest in modern inputs and technologies that could enhance their productivity, leading to low cocoa output. These issues underscore the need for an empirical investigation into the use of farm resources that affect cocoa production by small scale farmers to raise output in Boki LGA and identified strategies that could help the farmers overcome these challenges and boost cocoa production per hectare in the area.

Specifically, the study described the socioeconomic characteristics of cocoa farmers, examined farm resources such as farm size, labour, cocoa seedlings, herbicides, farm capital, and farm credit in cocoa production as well as identified other constraints that affect improved cocoa production in the area.

METHODOLOGY

Study area: The study was carried out in the Boki local government area, Cross River State, Nigeria. The LGA is located between Latitude 6°16'N and Latitude 6°20'N of the Equator and Longitudes 9°00'E and 9°08'E of the Greenwich Meridian. The LGA is bounded to the west by Ikom and Ogoja, to the north by Obudu and Obanliku, to the south by Etung LGA, and to the east by the Republic of Cameroon. The Boki LGA has a population of approximately one hundred and eighty-six thousand, hundred and eleven people (186,611) as in the 2006 census (National Population Commission, NPC, 2006). It has a total land mass of 1,070 km2 with a total population density of about 67.3 people per square kilometre (NPC, 2006).

The region is considered to have some of the most rugged terrain in Nigeria, as it is almost completely covered by the Cross River Rainforest (about one of the last remaining in the country) and the Afi mountain range (60% of which is inaccessible to vehicles throughout the year). The region is known internationally as a commercial centre for agricultural commodities such as cocoa, coffee, timber, palm products and other arable crops.

Sampling technique: A multistage sampling technique was used to select the small scale cocoa farmers based on their level of cocoa farming in the area. Four clans were purposively selected from the Boki local government area based on their large-scale production of cocoa by small scale farmers. Four villages were purposively selected from the selected clans because of their level of cocoa production, totalling 12 villages. With the assistance of the Extension Agents, a list of cocoa farmers was obtained from the Agricultural Development Extension Office of Boki LGA. The list contained one thousand, two hundred and fifty (1250) cocoa farmers and constituted the sampling frame. A proportionality ratio of 10% was applied to randomly select one hundred and twenty-five (125) farmers from the sample frame.
A structured questionnaire was used as the primary data collection tool. Secondary sources were textbooks, journals, the Internet, and other relevant literature.

Analytical technique: Descriptive statistics, such as frequency count, percentages, and mean, were used to describe the socioeconomic characteristics of the cocoa farmers. Regression analysis was used to determine the factors influencing cocoa production.

Implicitly, the regression model was specified thus:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, U)$ ----- (i)

Equation 1 was analysed using three functional forms (Linear, Semi-log and Double log). The variables regressed are shown below:

Y = output of Cocoa (kg)
X_1 = farm size (hectare)
X_2 = labour (in man-days)
X_3 = farm capital (Naira)
X_4 = cocoa seedlings (in Number)
X_5 = farm credit (Naira)
X_6 = herbicide (Naira /litre)
βo and βi are the constant and the regression coefficients respectively
εi = error term
A t-test embedded in multiple regression analysis was used to test the hypotheses of the study.

Mean scores from a 4-point Likert scale were used to identify constraints affecting the increased production of cocoa output. A mean value of 2.5 and above, were regarded as major constraints, while those with a mean value of below 2.5 were considered minor or no constraints.

RESULTS AND DISCUSSION

Socio-economic characteristics of the cocoa farmers: The socioeconomic characteristics of cocoa farmers in Boki are presented in Table 2. The results on gender indicate that the cocoa farming sector is predominantly male-dominated (72.8%) compared to females (27.2%). The reasons for this imbalance could be multifaceted, including cultural norms, the physical demands of cocoa farming, and possibly greater access to land and resources for men than for women (Edem and Oniah, 2024). This study agrees with those of Akinwale and Folarin (2018), Awoyemi and Aderinoye-Abdulwahab (2019), and Oniah and Osim (2024), who reported that 83.8%, 85.5%, and 80.2% of cocoa farmers in Oyo, Ekiti, and Ikom LGA of Cross River State were males.

Marital status from the table showed that the majority (65.6%) of farmers were married, and only a few (7.2%) were divorced. This indicates that cocoa farmers can source farm labour from their families. Adesope et al. (2018) noted that marriage among cocoa farmers conferred a sense of responsibility, which might account for the high number of married cocoa farmers in this study. This finding agrees with those of Akinwale and Folarin (2018), Oke et al. (2020), and Oniah and Osim (2024), who reported that 85%, 97.2%, and 57.5% respectively of the cocoa farmers in their study were married.

The results in Table 2 reveal that 64% of the farmers attended higher learning institutions. Adesope et al. (2018) stated that education plays an important role in cocoa farming activities as it gives the cocoa farmer insight into important farming technology and decision making that determines the success of their cocoa farming enterprise. This result agrees with those of Akinwale and Folarin (2018), Awoyemi and Aderinoye-Abdulwahab (2019), Oke et al. (2020), and Oniah and Osim (2024), who reported that cocoa farmers in their study had some level of formal education.

As shown in Table 2, the average number of years of experience in cocoa production was 17, with the majority (64.8%) of the farmers having 15-20 years of cocoa farming experience. This result implies that the cocoa farmers in the study area were knowledgeable about cocoa cultivation and production and could easily and efficiently utilize farm productive resources. Studies by Edem and Oniah (2024) have documented that experienced farmers can effectively manage inputs, leading to more efficient and profitable enterprises.

Table 2 shows that majority (83.2%) of farmers have membership in cooperatives, while (16.8%) do not belong to any cooperative. Members can benefit from access to subsidized farm inputs, information on effective farming techniques, improved cocoa farming technologies, and credit facilities provided by governments, international organizations, and financial institutions. This agrees with the findings of Adesope et al. (2018), who reported that the majority of cocoa producers in Nigeria were members of farmers' organizations.

Farm productive resources used in cocoa production in the study area

The linear functional model was chosen as the lead equation (LE) because of its best fit, highest values of the adjusted R^2, F-value, and more significant variable coefficient levels. The adjusted R2 showed that 87.9% of cocoa output variations were influenced by independent variables, with the remaining variation (12.1%) due to error or unincluded variables. The F-statistic value of 21.312 was significant at the 1% level, indicating the overall significance of the regression and goodness of fit of the model.

The results in Table 3 indicate that farm size had a positive and significant impact on cocoa output at ($p< 0.01$). This suggests that an increase in farm size by one percent leads to a corresponding increase in cocoa output per hectare. This finding is in tandem with that of Oniah and Osim (2024), who reported that farm size positively and significantly affected cocoa production in Ikom LGA of Cross River state.

The results in Table 3 show that labour has a negative coefficient of -0.413 and is significant at 1% level ($p< 0.01$). This result points to the presence of diminishing returns to labour, implying that additional units of labour input beyond a certain point do not result in a proportionate increase in cocoa output and may even lead to a decrease. Iroegbu et al. (2021) suggested that inefficiencies or overutilization of resources can lead to reduced productivity. Table 3 also shows a positive (2.123) and significant ($p< 0.01$) relationship between cocoa output and farm capital. With more capital, farmers can expand their farm size, purchase high-quality inputs, and invest in advanced agricultural technologies, which contributes significantly to boosting cocoa production. This finding aligns with the results of studies conducted by Adesope et al. (2018) and Oniah and Osim (2024), both of which reported a positive and significant correlation between farm capital and cocoa output.

Table 3 indicates that cocoa seedlings had a positive coefficient of 0.546 and were statistically significant at ($p<0.05$) level. This positive relationship implies that in a monocrop system, a higher seed rate typically results in a greater number of cocoa trees per hectare, leading to a higher yield. This finding is consistent with that of Oyibo et al. (2021), and Edem and Oniah (2024), who reported a positive and significant relationship between the number of seedlings sown and output per hectare.

The results presented in Table 3 indicate a statistically significant negative relationship between farm credit and cocoa output - ($p < 0.05$). This suggests that the provision of credit to cocoa farmers may not effectively translate into increased productivity. This finding is consistent with previous studies by Kuye and Edem (2019), who found that the diversion of agricultural credit for non-farm purposes is a common issue among small-scale farmers and contributes to suboptimal farm productivity.

From Table 3, herbicide resource was not statistically significant even at ($p < 0.1$), though had a positive value of 0.604. This finding suggests that herbicides contribute posivetiely to cocoa production, with potential benefits in reducing the manual labour required for pest and weed management, thereby enhancing productivity. This result aligns with previous studies by Awunyo-Vitor et al. (2016) and Buhari et al. (2018), who reported a positive relationship between plant protection

measures and crop yield in Ghana and Kebbi, Nigeria.

Hypothesis: Based on the multiple regression results presented in Table 3, farm size, labour, farm capital, cocoa seedlings, and farm credit significantly influenced ($p<0.05$) on cocoa output, while herbicides positively influence production in the area. Thus, the null hypothesis is rejected and its alternative form is accepted, implying that farm resources considered in the study have significant influence on cocoa output in the study area.

Constraints affecting increased production of cocoa production: Table 4 shows the rankings of the constraints faced by the cocoa farmers. Lack of improved cocoa varieties was the most severe constraint (3.33). The high ranking suggests a significant demand for better cocoa varieties among farmers, as the absence of these varieties can lead to lower yields and a higher susceptibility to pests and diseases. The absence of good storage facilities (3.22) and high costs of farm inputs (3.18) were also constraints. A lack of adequate storage facilities can result in significant losses, reduced income, and lower quality of produce, thereby affecting the overall profitability of cocoa farming. However, the high cost of agrochemicals hinders their adoption (Akinwale and Folarin, 2018). Akinwale and Folarin (2018) reported that cocoa production in Oyo State faced challenges of low productivity owing to aging trees and limited technology adoption. Awoyemi and Aderinoye-Abdulwahab (2019) reported the unavailability of planting material and the problem of pests and diseases as some of the constraints facing cocoa management practices in Ekiti. Similar studies conducted by Oke et al. (2020) in Osun and Ondo states, Nigeria, documented that the constraints facing cocoa production were deficient credit facilities, high cost of labour, poor roads, poor marketing and storage facilities, and a lack of access to technical tools.

CONCLUSION

Based on the findings of this study, the study concluded that about 87.9% of cocoa output variations were influenced by the independent variables of farm size, farm capital, cocoa seedlings, labour, herbicides and farm credit use by the cocoa farmers for cocoa production in the area. Lack of improved cocoa varieties, inadequate storage facilities, high input costs, and limited access to credit were some of the major constraints identified in cocoa production in the area.

Based on the findings of this study, the following recommendations were proposed to enhance cocoa production in the study area:

i. Female cocoa farmers should be encouraged by their male counterpart to be engaged in cocoa production as women were found to be fewer in cocoa production in the area. ii. Land reforms should be carried out as to allow more access land to cocoa farming as farm size was found to positively and significantly influence cocoa output in the area.

iii. Farm labour should be allocatively directed to areas of cocoa farming operations as this will reduce inefficiency in the use of farm labour.

iv. Improved cocoa seedlings should be planted by the cocoa farmers as this will raise output per hectare.

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Table1: Selection of respondents in the study area

Clans	Selected villages	Sample frame	Sample size
Irruan	Bunyia	120	12
	Esekwe	100	10
	Katchuan	140	14
	Ndimechang	90	9
Boje	Buanchor	80	8
	Katabang	120	12
	Kayang 1and2	130	13
	Boje	70	7
Eastern Boki	Olum	100	10
	Wula	120	12
	Okwabang	100	10
	Botatong	80	8
	Total	1250	125

Source: Field survey, 2023

Table 2: Socioeconomic characteristics of the cocoa farmers in the study area.

Variable	Frequency	Percentage (%)	Mean
Gender			-
Male	91	72.8	
Female	34	27.2	
Marital status			
Single	13	10.4 65.6	
Married	82 9	7.2	-
Divorced	21	16.8	
Widowed			
Educational Level			
No schooling	8	6.4	
Primary school	13	10.4 19.2	
Secondary school	24	64.0	-
Higher institution	80		
Farming experience			
1 - 5 years	4	3.2	
6 – 9 years	13	10.4 21.6	
10 – 14 years 15 –	27	31.2	17 years
19 years	39	33.6	
20 years and above	42		
Membership of cooperatives			-
Yes	104	83.2	
No	21	16.8	

Source: Field Survey Data, 2023

Table 3: Regression analysis of the effects of farm production resources on cocoa output

Variables	**Linear model (LE)**	**Semi-log model**	**Double-log model**
Constant	203.24 ***	179.66 ***	179.66 ***
Farm size (X_1)	0.512 (3.514) ***	0.352 (3.715) ***	0.514 (3.645) ***
Labour (X_2)	-0.413 (4.068) ***	-3.949 (1.063) ^{NS}	-3.949 (1.063) ^{NS}
Farm capital (X_3)	2.123 (1.007) ***	0.218 (-4.327) ***	0.218 (-4.327) ***
Cocoa seedlings (X_4)	0.546 (3.263) **	0.654 (1.190) ^{NS}	0.654 (1.190) ^{NS}
Farm credit (X_5)	-0.574 (-0.599) *	-0.058 (-0.234) **	-0.058 (-0.234) **
Herbicides (X_6)	0.604 (3.666) ^{NS}	0.643 (2.331) ^{NS}	0.643 (2.331) ^{NS}
R^2	0.912	0.889	0.706
Adjusted R^2	0.879	0.788	0.675
F – ratio	21.312***	18.111***	17.817***

Source: Field data, 2022. T-statistics are in parentheses; * 10%, ** 5%, *** 1%, NS = not significant

Table 4: Constraints affecting cocoa production in the study area.

Strategies	SA	A	D	SD	Total	Mean	Rank
Lack of improved cocoa varieties	63	45	12	5	125	3.33	1st
Lack of good storage facilities	68	28	17	12	125	3.22	2nd
High costs of farm inputs	64	29	22	10	125	3.18	3rd
No access to credit facilities / financial support	59	31	22	13	125	3.09	4th
Price fluctuation of cocoa seed	54	34	31	6	125	3.09	4th
Aging of cocoa plant	49	35	33	8	125	3.00	5th
Lack of adequate information media	56	24	30	15	125	2.97	6th
Pest and diseases	62	22	14	27	125	2.95	7th
Fake chemicals	51	28	29	17	125	2.90	8th
Little or no access to extension services	47	34	23	21	125	2.86	9th

Source: Field Survey Data, 2023