COST-BENEFIT ANALYSIS OF COCOA PRODUCTION IN IDANRE LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA

ABSTRACT

This study was carried out to investigate the cost-benefit of cocoa production in Idanre Local Government Area of Ondo State. Primary data were used for this study and a well-structured questionnaire and personal interview were used for the collection of the data. The production data covered a period of 3years (2018-2020)**.** The data were analyzed using descriptive statistics, budgetary technique and multiple regression analysis. The study showed that the majority (64.2%) of the farmers were within the active age group, with an average age of 55years old. About 72.5% of the cocoa farmers were male and 27.5% were female. The majority (68.3%) of the farmers were married and nearly (65.0%) had a household size of 4 – 6 members. The sampled cocoa farmers had an average farming experience of 17 years, while about 75% of the farmers had formal education and 25% had no formal education. The study revealed that the total costs were estimated to be ₦165,001.85, ₦120,822.62 and ₦108,243.55 for the period of 2018, 2019 and 2020, respectively. The study recorded a Net Farm Income of ₦360,437.17, ₦499,228.80 and ₦591,993.82 across the years. The result of the cost-benefit analysis showed that at an interest rate of 20%, cocoa production was profitable. Also, a benefit-cost ratio of 4.48 was obtained indicating that for every N1 invested in cocoa production, a profit of N3.48 kobo was made as a profit which implies that cocoa production was profitable in the study area. The result revealed that inadequate credit facilities are the major constraint in the study area followed by inadequate modern equipment. This implies that the majority of the cocoa farmers are still practising the traditional farming method. Therefore, it is recommended that extension workers should be visiting the farmers in the study area regularly to enlighten them on modern techniques to adopt to boost cocoa production in the study area

Keywords: Benefit-Cost, cocoa, Net Farm Income, production, profitability

Introduction

Cocoa production was an integral component of the Nigerian economy in the colonial and post-colonial eras [1, 2]. The performance of this commodity (cocoa) was a significant constitutive element of rural earnings and Nigeria's capital formation in the period in which South-West Nigeria hosts the major cocoa farms in Nigeria [3, 1]. Since the 1950s, cocoa production has been a major means of livelihood for many people [4, 5]. Again, cocoa plays a significant socio-economic role in Nigeria [6, 5] as it accounts for about 2% of the national export earnings and over 200,000 rural households in 14 cocoa-producing states depend on cocoa for the majority of their cash

income. According to [7], millions of people are dependent on cocoa for their livelihoods in different areas of the supply chain such as trade, transport, processing, and export of cocoa and its products.

The Nigeria cocoa economy has a good record which is well documented in the literature. It has remained a valuable crop and major foreign exchange earner among other agricultural commodity export of the country [8, 9]. Apart from its contribution to the nation's economy, Cocoa is a plant-based food that contains carbohydrates, fats, proteins, natural minerals and some vitamins and like several other plant foods such as tea, red wine, fruits, vegetables and nuts cocoa contains a group of compounds which exhibit health benefits [10].

Due to its importance, the recent Federal Government's concern of diversifying the export base of the nation has placed cocoa in the centre stage as the most important export tree crop. Evidence has, however, shown that the growth rate of cocoa production has been declining, which has given rise to a fall in the fortunes of the subsector among other reasons. [8] noted that cocoa production in Nigeria witnessed a downward trend after the 1971 season when its export declined to 216,000 metric tons in 1976, and 150,000 metric tons in 1986, therefore reducing the country's market share to about 6% and the fifth largest producer to date.

Prior to the Structural Adjustment Programme (SAP), cocoa marketing was carried out by the erstwhile highly regulated Commodity Marketing Boards, which was known to pay farmers far less than the export price of cocoa. This situation affected cocoa production and export in the past as it served as a disincentive to investment in cocoa production. Even after the abolition of the Marketing Boards structure, cocoa production has still not been better as is evident in the declining production trend reported in previous studies [11]. One of the possible reasons for this may be the nature of investment in cocoa production, as to whether the returns from cocoa are not being threatened by such factors as rising costs of production, price instability, differences in management systems and perhaps declining productivity due to ageing trees [12]. Moreover,

poor marketing infrastructure, low productivity, poor quality of local produce, and low efficiency are the main problems facing the enterprise [4]. Generally, beyond this, information on how the different inputs affect costs and returns has scarcely been documented. Although the cocoa production sector holds an important position on economic development in Nigeria, systematic studies have not been conducted on cost-benefit analysis of cocoa production in the study area. The study attempted to bridge this gap and add to the body of knowledge on the cost and return benefit of cocoa production in Nigeria, emphasising the subject theme and area. More so, the findings of this study will not only depict the cost of cocoa production but will also be a guide for policymakers to effectively plan for the growth and development of the cocoa industry through the formulation of effective policies.

Thus, this study investigated the cost-benefit of cocoa production in Idanre Local Government Area of Ondo State, Nigeria. The specific objectives of the study are to:

i. describe the socio-economic characteristics of cocoa farmers in the study area;

ii. determine the cost-benefit of cocoa production in the study area;

iii. examine the factors affecting the revenue of cocoa farmers in the study area; and

iv. identify the main constraints facing cocoa farmers in the study area.

2. Methodology

The study was carried out in Idanre LGA of Ondo State, Nigeria. There are 18 Local Government Areas (LGAs) in Ondo State with its capital in Akure. It has about 3,441,024 people [13]. The main vegetation types are mostly evergreen forests in the south and derived savannah of Saki zone where there is mixed semi-deciduous forest and dry deciduous forest. The soils are mainly Alfisols and Entisols. Agriculture is the main occupation of men; women frequently farm

independently of their husbands and, in general, are engaged in gainful activities such as food processing and petty trading in addition to their domestic responsibilities. The town is located at the Idanre hill which is of unique cultural and environmental significance. that attracts many tourists. The town is about 20km southeast of the state capital Akure, with an area of 1914 km^2. Idanre is the largest cocoa producing area in Ondo State. Idanre is mainly a Yoruba speaking tribe (similar to the Ondo dialect) with the majority being into farming and trading.

Primary data were used for the study. The data were generated through a well-design questionnaire which was administered to one hundred and twenty randomly selected farmers. The production data covered a period of 3years (2018-2020)

A multi-stage sampling technique was adopted for the study. The first stage of the techniques was a purposive selection of three (3) districts in the LGA, which are: Ododе-Idanre, Alade and Atosin. The selection was done based on the large population of cocoa farmers in the areas. The second stage involved the random selection of five (5) villages each from the selected (3) districts while the third stage was a random selection of eight (8) cocoa farmers each from selected villages. Hence, a total number of one hundred and twenty (120) respondents were used for the research as a sample size.

The analytical tools to address the set objectives of the study include descriptive statistics, budgetary analysis, and multiple regression analysis Budgetary techniques that were employed included: Net Present Value (NPV) and Benefit-Cost Ratio (BCR). These were indicators that determine the worthiness of an investment.

(i) Net Present Value is expressed as $NPV= Rt / (1+i)t$

Where:

t= time of the cash flow

i= discount rate

Rt= net cash flow

(ii) Benefit-Cost Ratio is expressed as:

BCR= PV of expected benefits / PV of expected costs

Model Specification: Multiple regression analysis was used to identify the factors that affect cocoa production in the study area. Multiple regression analysis allows assessing the strength of the relationship between an outcome (the dependent variable which is continuous and several independent variables), following [14, 15].

The regression model in its implicit form is given as:

$Yi = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8)$.

Where Y = Revenue on cocoa production (₦)

X_1 = Age of farmers (years)

X_2 = Level of education(years)

X_3 =Household size

X_4 = Experience in cocoa production (years)

X_5 = Farm size in hectares

X_6 = Labour cost (₦)

X_7 = Chemical input in litres

X_8 = Access to credit (dummy; 1=Yes; 0= No)

U = Error term.

The following functional forms were estimated for the production function and the one that best satisfies the theoretical, statistical and econometric criteria for a production function was selected

as a lead equation. The functional forms that were estimated were: Linear, semi-log, double log and exponential.

Linear function:

$$Yi = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_{7+} b_8X_8 + Ui$$

Semi-Log:

$$Yi = b_0 + b_{1log}X_1 + b_{2log}X_2 + b_{3log}X_3 + b_{4log}X_4 + b_{5log}X_5 + b_{6log}X_6 + b_{7log}X_{7+} b_{8log}X_8 + Ui$$

Exponentials:

$$Log\ Yi = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_{7+} b_8X_8 + Ui$$

Double log

$$Log\ Yi = b_0 + b_{1log}X_1 + b_{2log}X_2 + b_{3log}X_3 + b_{4log}X_4 + b_{5log}X_5 + b_{6log}X_6 + b_{7log}X_{7+} b_{8log}X_8 + Ui$$

3. Results and Discussion

Socio-economic Characteristics of the Respondents

This section presented and discussed the results obtained from the analysis carried out in this study. Gender play important role in farm activities carried out by farmers and determine the adoption of technologies. Female, as well as their male counterparts, have some specific responsibilities in farm labour which varies from one country to another and from one ecological zone to another. As shown in Table 1, the majority (72.5%) of the cocoa farmers in the study area were male while only 27.5% of them were female. This implies that men dominated the production of cocoa in the study area. The female farmers have their roles to play, especially in the maintenance and processing of cocoa beans. This was also in line with the findings of [16, 17]. The result from Table1 also showed that the majority (68.3%) of the respondents were

married while only 5.0% of them were single, 26% of the cocoa farmers were widowed and only 5.0% of them were divorced. The implication of this is that farmers in the study area were mature and can effectively take crucial decisions jointly with their spouses.

The marital status of a person determines the degree of responsibility of that person in a household, and in the society at large. The significance of marital status on agricultural production can be explained in terms of the supply of agricultural family labour. The results showed that many (68.3%) of the respondents were married, nearly 21.7% were widowed and about 5% of them each were single and divorced in the area. This is also similar to the findings of [17]. It is expected that family labour would be more available where the household heads are married. Age has been found to affect the rate of farmers' adoption of innovation, which in turn affects household productivity and livelihood improvement strategies. Age is very important in agricultural production; it affects attitude to work on the farm and efficient utilization of resources. The age of a farmer determines the ability to adopt innovations.

Therefore, the Table further revealed that about 26% of the cocoa farmers in the study area were 51years old and above, while 12.5% of them were between 41 and 50 years of age and 15.8% of them fell between 30 and 40 years old. Those that fell within 30 years and below were 7.5%. with an average age of 54.6years. The farmers were old and should be able to make a rational decision with respect to cocoa production activities. Education is an important factor influencing the adoption of farm innovations. It was shown that about 25.0% of the respondents were illiterate, about 18.3% of the respondents completed primary school education. 34.2% of the respondents completed secondary school education and 22.5% had tertiary education. It could be inferred that cocoa farmers in the study area were literates who could read and write**.** It was revealed that the majority (65.0%) of the cocoa farmers in the study area had a household size

between 4 and 6 persons. While nearly 6.7% of them had less than 3 members per household. Also, 20.8% and 7.5% of the respondents had 7-10, and 11 above members, respectively. 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. Household size has a great role to play in farm labour provision in the agricultural sector. Experience is an important factor determining both the productivity and the production level in farming. But the effect of farming experience on productivity and production may be positive or negative. 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 [11]. The result also revealed that the cocoa farmers had an average of 17 years of experience in cocoa production. The implication of this is that an average respondent had considerable cocoa farming experience. The result also revealed that 39.2% of the respondents had less than 3 hectares of farm size, 34.2% of them had between 4 and 6 hectares of farm size, 16.7% between 7 and 10 hectares of farm size and10% had more than 11 hectares of farm size.

Table1 Socioeconomic Characteristics of the Respondents

Gender	Frequency	Percentage	Mean
Male	87	72.5	
Female	33	27.5	
Total	120	100.0	
Marital Status			
Single	6	5.0	
Married	82	68.3	
Widowed	26	21.7	
Divorced	6	5.0	
Total	120	100.0	
Age			
<30	9	7.5	
30-40	19	15.8	

41-50	15	12.5	
>50	17	64.2	
Total	120	100	
Household Size			
<3	8	6.7	
4-6	78	65.0	5.2
7-10	25	20.8	
>10	9	7.5	
Total	120	100.0	
Experience			
<10	32	26.7	
11-20	30	25.0	17
21-30	19	15.8	
31-40	9	7.5	
41-50	20	16.7	
>50	10	8.3	
Total	120	100.0	
Farm Size			
<3	47	39.2	
4-6	41	34.2	
7-10	20	16.7	
>11	12	10.0	
Total	120	100.0	

Source: Field Survey, 2021

Costs and Returns

The result from Table 2 revealed the total cost incurred and revenue accrued from cocoa production for three (3) years. The result showed that a total cost of ₦165,001.85, ₦120,822.62 and ₦108,243.55 were incurred in the years 2018, 2019 and 2020, respectively. The result revealed labour cost accounted for the largest portion of the operating expenses in all the years of operation. This was followed by the cost of agrochemical as also reported in [6]. It was noted that depreciation on various fixed assets varied during the years under consideration. This may be as a result of the replacement of some farm tools (cutlass and spraying machine). The study further recorded a Net Farm Income of ₦360,437.17, ₦499,228.80 and ₦591,993.82 across the years. Furthermore, the result showed that cocoa production was most profitable in the year

2020. Also, the price of cocoa was N1200 per kilogram in the same year being the highest during the period of operation This study also revealed that the average rate of returns on investment (returns per naira invested) were 3.18, 5.13 and 6.47 in years 2018, 2019 and 2020 respectively on cocoa farming, indicating that for every N1 invested on cocoa farming in the study area, a profit of N2.18, N4.13 and N5.47 were made in years 2018, 2019 and 2020 respectively. However, the inflation rate in Nigeria between the years 2018, 2019 and 2020 was 12.09%, 11.4% and 13.25% respectively. This may account for the record of highest profit in the year 2020. It is noted that the exchange rates of dollar to naira in years 2018, 2019 and 2020 were N361, N360 and N380 respectively. The implication of this exchange rate of dollar to naira is that the exportation of cocoa will be cheaper in the year 2020 than in the years 2019 and 2020 because of the exchange rate or depreciation of the naira.

Table 2: Costs and Returns Analysis

Items	**2018**	**2019**	**2020**
Variable cost			
Agrochemicals	11,206.57	10,924.22	15,400.20
Seedlings	22,235.40	15,450.00	8,482.00
Labour	106,250.00	65,270.40	45,002.00
Transportation	8,540.00	10,125.00	15,205.80
Total variable cost	**148,231.97**	**101,769.62**	**84,090.00**
Fixed cost			

Rent on land	12,721.43	15,330.00	19,500.00
Deprecation on Fixed assets (Farm tools)	4048.45	3,723.00	4,653.55
Total fixed cost	**16,769.88**	**19,053.00**	**24,153.55**
Total cost	**165,001.85**	**120,822.62**	**108,243.55**
Returns	**525,438.02**	**620,051.20**	**700,249.15**
Profit	**360,437.17**	**499,228.80**	**591,993.82**

Source: Field Survey, 2021

Table 3: Sales pattern of average cocoa farmer between 2018 and 2020

Year	Quantity of cocoa produced/kg	Price of cocoa/kg	Total Revenue
2018	553.1	950	525,438.02
2019	620.1	1000	620,051.20
2020	583.5	1200	700,249.15

Cost-Benefit of Cocoa Production

The result from table 3 showed that cocoa production was most profitable in the year 2020 in the study area with a profit of ₦591,993.82, a cost and revenue of ₦108,255.33 and ₦700,249.15 respectively.

Table 4 also showed the Net Present value calculation of cocoa production for the period. The Net Present Value is N980,473.36 at an interest rate of (20%). The financial institution interest rate was (18 %). Thus, cocoa production is expected to produce more income than the cost at the current discount rate. Also, a benefit-cost ratio of 4.48 is obtained indicating that for every N1 invested in cocoa production, a profit of N3.48 kobo was made which implies that cocoa production is profitable in the study area. These results support the findings of [18-19].

Table 4: Cost-Benefit Distribution of Cocoa Production

Year	**Cost(₦)**	**Revenue(₦)**	**Profit or incremental Benefit (₦)** **(Revenue – cost)**
2018	165,000.85	525,438.02	360,437.17
2019	120,822.4	620,051.20	499,228.80
2020	108,255.33	700,249.15	591,993.82

Source: Field Survey, 2021

Table 4 (Continued)

Year	**incremental Benefit**	Discount Factor at 20%	Net Present Value at 20%	Discounted cost (Cost x Discounted factor)	Discounted Revenue (Revenue x Discounted factor)
2018	360,437.17	0.833	300,244.16	137,484.70	437,689.87
2019	499,228.80	0.694	346,464.78	83,850.74	430,315.53
2020	591,993.82	0.579	342,764.42	62,679.83	405,444.25
Total			989,473.36	283,976.27	1,273,449.65
NPV(Profit x d.factor)		989,473.36			
Cost-benefit		4.48			

Source: Field Survey, 2021

Regression Analysis of Factors Affecting Cocoa Production

The lead equation was the double log which was selected based on the fact that it has the highest adjusted R^2 and the high number of significance levels. The estimated adjusted R^2 of 0.64 indicated that 64.3% variation in variable Revenue were explained or caused by the independent variables. The result revealed that age, cost of labour and access to credit were the factors affecting the cocoa revenue in the study area. The result from the Table also showed that the coefficient of farmers' age has an inverse relationship on cocoa revenue and it is significant at a

5% level. This implies that the higher the respondent's age, the lower the revenue of cocoa in the study area. The result also indicated that if the farmer's age is increased by one year, there will be a decrease of about 88% in the revenue. This result supports the findings of [19, 20] who also confirm the negative relationship between age and cocoa output. Also**,** the result revealed that the coefficient of cost of labour has a negative effect on cocoa revenue in the study area and it was significant at a 5% level. This implies that a naira increase in labour cost will reduce the revenue on cocoa by 88.4%... Furthermore, the result revealed that education has an inverse relationship with cocoa production in the study area. This may be as a result of some of the people that retired from civil service that now take cocoa farming as a major occupation after retirement but their level of education does not affect the cocoa business positively. Access to credit is statistically significant at a 5% level and has a positive relationship with cocoa revenue in the study area. This implies that a unit increase in the farmer's chance of accessing credit will bring about a 50% increase in cocoa revenue. The results also shared the same view with the findings of [9, 21, 22].

Table 5: Regression result showing the factors affecting cocoa production

Variables	Linear	Exponential	Semi-log	Double-log
(Constant)	496.912(0.043) **	-695599117.8(0.72)	14.099(0.000) ***	22.074(0.008) ***
age of respondents	-6.381(0.031) **	195041805.5(0.637)	0.008(0.674)	-0.884(0.017) **
education level	7.387(0.869)	321402055.0(0.164)	0.126(0.701)	-0.228(0.041)
household size	10.493(0.535)	159266046.0(0.491)	-0.041(0.713)	-0.029(0.969)
years of experience	2.218(0.494)	143793640.0(0.325)	0.006(0.791)	-0.027(0.954)

farm size	34.43(0.113)	131903022.6(0.442)	-0.066(0.622)	0.16(0.775)
Labour cost	-0.006(0.029) **	-144336558.8(0.196)	-0.019(0.284)	-0.884(0.031) **
Agrochemicals	-0.027(0.001) ***	-84881872.4(0.439)	0.000(0.047) **	-0.298(0.407)
Access to credit	139.657(0.042) **	132222463.8(0.634)	0.130(0.725)	0.501(0.048) **
Adjusted R^2	.435	.092	.073	.643
F-Value	5.985	.996	.998	9.235
***	Significant at 1%			
**	Significant at 5%			
Dependent variable:	Revenue (N)			

Source: Field Survey, 2021

Constraints Militating Against Cocoa Farmers

Table 6 showed that farmers in the study area were faced with a lot of challenges. These major challenges were highlighted and ranked. The result revealed that inadequate credit facilities were the major constraint in the study area followed by a lack of inadequate modern equipment. This implies that the majority of the cocoa farmers are still practising the traditional farming method. Incidence of pests and diseases was ranked the third major constraint. This was also observed by [18, 23] in their study carried out among farming households in Cross River State, Nigeria. The high cost of transportation was ranked the fourth major challenge militating the cocoa farmers in the study area, this is as a result of far distance and the bad road to their farm. Shortage of labour,

environmental hazard, lack of market information and unstable price were ranked seventh, eighth, ninth and tenth constraints, respectively. The results of this study shared similar views with the studies of [4, 22, 25, 24]

Table 6: Distribution of Constraint Militating Against the Cocoa Farmers

Constraint	Not at all		Mild		Serious		Very serious		Mean	Rank
	F	%	F	%	F	%	F	%		
Inadequate capital/credit	11	9.2	30	25	22	18.3	57	47.5	3.04	1
Lack of modern equipment	15	12.5	24	20	33	27.5	48	40	2.95	2
Pest and Disease	46	38.3	8	6.7	32	26.7	34	28.3	2.45	9
Transportation cost	16	13.3	31	25.8	30	25	43	35.8	2.83	4
Incidence of pilfering/theft	25	20.8	18	15	29	24.2	48	40	2.83	5
Unavailability of input	24	20	22	18.3	29	24.2	45	37.5	2.79	6
Shortage of labour	23	19.2	30	25	19	15.8	48	40	2.77	7
Environmental hazard	31	25.8	17	14.2	26	21.7	46	38.3	2.73	8
Inadequate market information	34	28.3	20	16.7	32	26.7	48	40	2.90	3
Unstable price	39	32.5	24	20	23	19.2	34	28.3	2.43	10

Source: Field Survey, 2021

Conclusion and Recommendations

The study empirically evaluates the cost-benefit associated with cocoa production with a case study of Idanre Local Government Area of Ondo State, Nigeria. The study unveils that male households form the majority in the cocoa production enterprise and many of them are married. The farmers are getting older with at least over 10 years of farming experience and they cultivate an average of about 5 hectares of land. Based on the findings of the study, it could be concluded that cocoa production was found to be a profitable enterprise in the study area. The Net Present Value which is the difference between the cash outflow and cash inflow of cocoa production was N989,473.36. Also, The enterprise is profitable and economically viable for a sustainable livelihood. The findings show that a farmer can get back times four his/her investment per annum. The study also concludes that cocoa farmers' age, cost of labour and access to credit are factors affecting cocoa revenue and that majority of the cocoa farmers were still practising the traditional farming method. The constraints such as inadequate funds, lack of modern equipment, inadequate market information, and transportation cost are seriously faced by the cocoa farmers in the area. Therefore, it is recommended that extension workers should be visiting the farmers in the study area regularly to enlighten them on modern techniques to adopt to boost cocoa production in the study area. The cost of labour can be reduced by encouraging modern techniques of farming and also encouraging farmers to adopt the use of machinery. Again, Government should provide soft loans to the farmers, and also create more access by making loans available and affordable at a one-digit interest rate. Young farmers should be encouraged to the enterprise by giving incentives and providing an enabling environment.

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