Economic Appraisal of Income Inequality among Cocoa Farmers in Ondo State, Nigeria

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ABSTRACT

This study focused on the determinants of income inequality among cocoa farmers in Ondo State, Nigeria. The primary data were collected with the aid of structured questionnaire in three local government areas of the State through a multi-stage sampling procedure. Data collected were analyzed using descriptive statistics, Gini coefficient, index of dissimilarity, regression analysis and fields method. The mean income of the respondents was ₦934,219.18, with Gini-coefficient and index of dissimilarity of 0.64 and 0.78 respectively. It was also revealed in the study that household size, farming experience and farm size is significant factors that determine the income of cocoa farmers in the study area. The coefficients of these variables were found to be significant at 1% level of significance. Other factors that significantly determine the income of cocoa farmers in the study area include: age of the cocoa farmer, cost of labour and amount of credit obtained. The coefficients of these variables were found to be significant at 5% level of significance. The field's method also revealed that marital status and amount of credit obtained reduces income inequality by 0.01% and 3.2% respectively.

Key words: Cocoa Farmers, Inequality, Economic Appraisal

INTRODUCTION

Agriculture has been a cornerstone in Nigeria economy and a major source of income to about 90% of the rural dwellers. Agriculture is by far the widest spread form of human activity and it is more basic than any other sector [1]. With the abundance of human and natural resources, Nigeria rural sector accommodates 70% of the nation's population and employs about 75% of the labour force as well as contributes 40% to the nation's Gross Domestic Product. The ultimate goal of agricultural plans and production in national development is to raise the standard of living. Standard of living is related to many other factors and its measurement involves attention to a considerable number of variables. One of the important yard sticks for measuring standard of living is the average distribution of income. It was reported that when economic growth increases, the incidence of poverty also increases and this has a decline effect on general agriculture production. High level of income inequality exists in developing countries [2]. Income inequality has been described as the major challenge of our time [3] and has a significant relationship with poverty incidence in a country [4].

Though inequality is not an exclusive phenomenon of a particular nation, its existence is on a significant scale in Africa in general and Nigeria specifically. Observations also revealed that income inequality is more endemic in the rural areas of Nigeria despite numerous natural and human resources with enormous agricultural potentials. Income inequality exists in cocoa production which expectedly plays a significant role in supporting

the livelihoods of individuals and economic growth of many African countries [5,11]. This is worrisome because this gloomy situation has generated some unpleasant concern to the Nigerian economy and therefore calls for immediate attention of government, individuals and researchers. Several studies in Nigeria [6,10] have decomposed income inequality by economic sector, income sources and household characteristics (including educational and occupational attributes of workers). Most of these studies were conducted at the Local Government level, and the studies are useful because they help to identify the structure of income inequality within a given society.

However, their application for policy formulation at the national level is limited due to small scope. This study seeks to add to the already existing body of knowledge by examining the determinants of income inequality among cocoa farmers in Ondo State, Nigeria. The knowledge of income inequality will also help policy makers to formulate policies that will ensure reduction in the level of income inequality among cocoa farmers in Ondo State, Nigeria in order to improve the welfare status of the target farmers and boost cocoa production across the state.

METHODOLOGY

This study was carried out in Ondo State, a Western part of Nigeria, which created in 1976. The State is situated between longitudes 4° 15^1 E and 6° 00^1 E of the Greenwich meridian and latitudes 5° 45^1 N and 7° 45^1 N which is the North of the equator in the South West Nigeria. The State occupies a land area of about 15,000 Square kilometers with a population of 3,441,924 people according to 2006 census. Agriculture is the mainstay of the people of Ondo State. The climate of the area is highly favoured for agrarian activities of her teeming population who grow crops such as cocoa, kola nut, palm treeand arable crops like: maize, yam and cassava. The annual rainfall is between 1000mm and 1500mm with a high daily temperature of about 30^oC. The vast majority of the population consists of peasant farmers cultivating food and cash crops at a small-scale level. Multi- stage sampling procedure was used in selecting the sample size. At the first stage three local government areas dominant in cocoa production namely; Idanre, Ile-Oluji/Oke-Igbo, and Owo were purposively chosen. At the second stage, two communities were randomly selected from each of the 28local government areas. The third stage involved random selection of fifty (50) cocoa farmers fromthe two communities selected in Idanre local government area, forty (40) cocoa farmers from the two communities selected in Ile-Oluji local government area and thirty (30) cocoa farmers from thetwo communities selected in Owo local government area of the state making a total of 120 cocoa farmers based on their cocoa production levels. Four of the respondents did not fill the questionnaire correctly and they are not used for the analysis. In essence, only 116 cocoa farmers were sampled. Primary data was used for the purpose of this study. Data were collected on socio-economic characteristics such as: age, gender, farming experience, level of education, farm size, etc. using structured questionnaire. Other information's ought include income and house hold size. The analytical techniques that were employed include descriptive statistics such as: frequency; percentage to describe the socio-economic characteristics of the respondents. Secondly, the study used the Gini coefficient and the Lorenz curve to determine the income inequality among cocoafarmers. Thirdly, it used Ordinary Least Square regression to examine the determinants of income among the respondents. Lastly, it used the coefficients estimated from the OLS regression to find the percentage contributions of these determinants to the Gini coefficient. Lorenz curve and Gini coefficient was used to identify the existence of income inequality and determine the level of income inequality among cocoa farmers in the study area.

Following Morduch and Sicular (2002) where incomes are considered so that [7]

$Y1 \leq Y2 \leq Y3 \dots \leq Yn,$

The Gini coefficient was computed as follows:

$$G_y = \frac{2}{n2\mu} \Sigma \left[r - \frac{n+1}{2} \right] Yi \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. \ (1)$$

Where

n= number of observation
μ= the mean of the distribution
Yi= income of the ith household
r = corresponding rank of income
G_y =Gini coefficient

According to Mafimisebi and Oguntade (2011) [8] the Index of Dissimilarity "ID" is the summation of vertical deviations between the Lorenz Curve and line of perfect equality [12]. The closer the ID is to 1, the more dissimilar the distribution is to the line of perfect equality. The Index of dissimilarity is expressed as follows:

$$ID = 0.5 \ \Sigma_{i=0}^{n} \ /Xi - Yi/ \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(2)$$

Where

Xi= cumulative proportion of the cocoa farmers
Y= cumulative proportion of the income of the cocoa farmers. This model was adopted from [9]

The determinants of income among the respondents was examined using multiple regression analysis involving the use of Ordinary Least Square [OLS]

Four functional forms: linear, semi-log, double-log and exponential were tried

Linear function: Y = $\beta 0$ + $\beta 1X1$ + $\beta 2X2$ + $\beta 3X3$ + $\beta 4X4$ +…… βnXn+ Ɛ …………………….(3)
Semi log function: Y = $\beta 0$ + $\beta 1logX1$ + $\beta 2logX2$ + $\beta 3logX3$ + $\beta 4logX4$+…+ $\beta n \ logXn$+ Ɛ …(4)
Double-log : LnYL= Ln$\beta 0$ +$\beta 1LnX1$+ $\beta 2LnX2$ + $\beta 3LnX3$ + $\beta 4LnX4$ + ……+ $\beta nLnXn$+ Ɛ …(5)
Exponential : nLog Y = $\beta 0$+ $\beta 1X1$ + $\beta 2X2$+ $\beta 3X3$ + $\beta 4X4$ +……….+ βnXn + Ɛ………..........(6)

Y=Total income of the respondents (₦)
X1=Age of the respondents (years)
X2=Sex of the respondents
X3=Marital status
X4=Educational level (years)
X5=Household size (number)
X6=Farming experience (years)
X7=Farm size (hectares)
X8=Cost of labour (₦)
X9=Total expenses (₦)
X10=cocoa output (tons)

X11=Amount of credit obtained (₦)
X12=Access to Extension service (4 times per year)
Ɛ=error term

The equation of best fit was chosen based on the following criteria:

1. The coefficient of multiple determinations R^2
2. The relative magnitude of the adjusted R^2
3. The statistical significance of the estimated coefficients in terms of their magnitude and signs
4. The overall significance of the whole function based on the F-value.

The coefficients obtained from the OLS regression was used to find the percentage contribution ofthe variables to the level of inequality (Gini coefficient), also known as the factor inequality weights *sj:*
sj: $Cov\ (\beta j\ Xj,\ InY)/\sigma 2(InY) = \beta j * \sigma(Xj) * Cor(Xj,InY)/\sigma(InY)5$………………………………….(7)

Where βj represents the estimated coefficients from the OLS regression of the *jth* characteristic of an individual, and *Xj* represents the value taken on by jth the characteristic. $\sigma\ (Xj)$and $\sigma(InY)$ are the standard deviation of (*Xj)* and of *(InY),* respectively and *Cor(Xj,InY)* is the correlation between factor *j* and *InY*. Therefore, *sj*(*In Y*) indicates the share of *jth* characteristic in inequality (Gini index), due to the fact that *Xj* is unequally distributed among cocoa farmers. The positive *sj* implies that *j* is an inequality-increasing factor whereas the negative *sj* means that the factor *j* decreases the inequality. The *sj* are summed to one, $\Sigma sj+sE = 1$, where *sE* is the inequality arising from the omitted variables and $\Sigma\ sj$=R2 i.e. the explanatory power of the income regression determines the proportion of inequality explained. The equation clarifies that the factor inequality β weights will be large if

(i) βj is large, that is, characteristic *Xj* has a large return
(ii) *Xj* varies highly relative to yearly income; or
(iii) There is a high correlation between the *Xj* characteristic and the yearly income.

RESULTS AND DISCUSSION

Other sources of income

Figure 1 presents the distribution of respondents by their other sources of income in the study area. Four major categories of other sources of income were identified in the study area. The first category was income from government employment in which 1.72% of the respondents earned eachof the following income ranges ₦100,000 to ₦200,000, ₦300,001 to ₦400,000, ₦400,001 to ₦500,000 and ₦600,001 to ₦700,000 respectively while 0.86% of them earned within ₦700,001 to₦800,000. The second category was income from non-government employment 4.31% of the respondents earned within each of these income ranges below ₦100,000 and ₦100,000 to ₦200,000 respectively while 2.59% of them earned within income range of ₦400,001 to ₦500,000. The third category was income from their relative 5.17% of the respondents earned belowN100, 000 and 2.59% earned within income range of ₦100,000 to ₦200,000 and the fourth category was income from business that are non-agricultural where 6.03% of the respondents earnedwithin ₦100,000 to ₦200,000 and 3.45% of them earned within income range of below ₦100,000.This implied that majority of them made extra income from non-government employment and businesses that are not agricultural related.
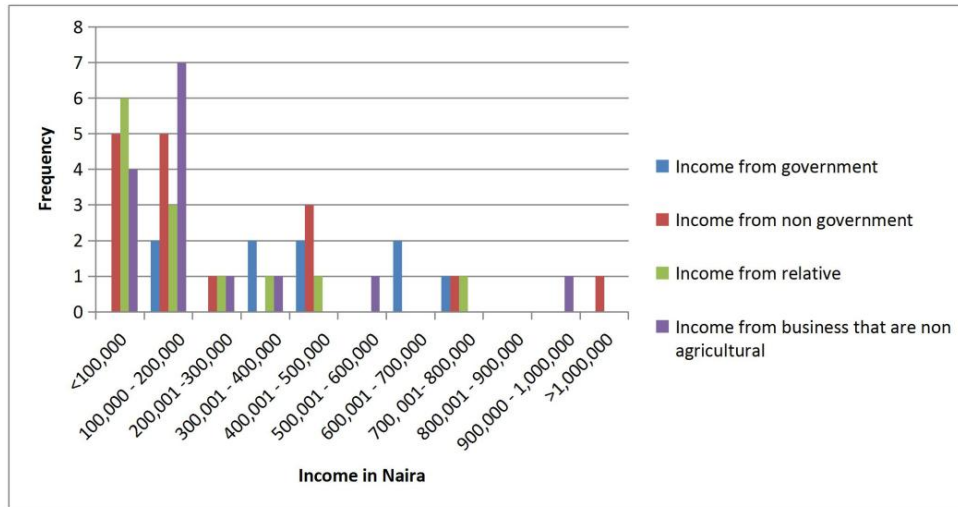
Figure 1: Chart showing other sources of income of the respondents

Income inequality among cocoa farmers in the study area

Table 1 presents the level of income inequality among cocoa farmers in the study area. The cocoa farmer's incomes were presented in seven different categories. It was revealed that the cocoa farmers with annual income of less than ₦400,000 accounted for 6.0% of the total respondents, cocoa farmers with income ranging between ₦400,000 and ₦800,000 represented 41.0% of the total respondents, cocoa farmers with income ranging between ₦800,001 and ₦1,200,000 accounted for 14% of the total respondents, while farmers with income ranging between ₦1,200,001 and ₦1,600,000 represented 16.0% of the total respondents. It was further revealed that cocoa farmers with income ranging between ₦1,600,001 and ₦2,000,000 accounted for 8.0% of the total respondents, cocoa farmers with income ranging between ₦2,000,001 and ₦2,400,000 represented 7.0% of the total respondents, while farmers with income greater than ₦2,400,000 represented 9.0% of the total respondents in the study area. The mean annual income of the respondents was ₦934,219.18. The Gini-coefficient used as indicator of income inequality revealed thatthe income group of ₦2,400,000 and above recorded the highest proportion in income distribution (Income proportion = 0.09) among all the income groups of cocoa farmers in the study area. Income inequality was observed to be second highest among the income group of ₦400,000 – ₦800,000 (Income proportion = 0.08). Proportion of income was found to be 0.07 among the income groupof ₦1,200,001 – ₦1,600,000. However, the only income group with no disparity in income proportion among the cocoa farmers is the group that earns <₦400,000. The Gini-coefficient for the income distribution was 0.64 while the index of dissimilarity was 0.78. The Gini-coefficient and index of dissimilarity of income indicate that the level of inequality was high in the distribution of total income among cocoa farmers in the study area. This agreed with (Oguntade, Adewumi, Okafor and Fatunmbi, 2015) that there was some level of inequality in the distribution of incomes of cocoa farmers in Ondo State.

Table 1: Determinants of income among cocoa farmers

Variable	β	Standard Error	t-value
Age	-0.015**	0.007	-2.010
Sex	0.179	0.191	0.936

| Marital status	0.013	0.106	0.120
Educational level	0.018	0.012	1.553
Household size	0.123***	0.020	6.286
Farming experience	0.018***	0.006	3.128
Farm size	0.040***	0.009	4.478
Cost of labour	-2.459×10^{6}**	0.000	-2.014
Amount of credit obtained	-4.517×10^{7}**	0.000	-2.182
Access to extension agents	0.009	0.087	0.101
Constant	12.591	0.444	28.348

*** = Significant at 1%; ** = Significant at 5%
R=0.851; R^2= 0.723; ADJ R^2= 0.694; F-value = 24.727
Source: Field Survey, 2018

N=number of cocoa farmers; X=proportion of cocoa farmers; CF=cumulative frequency; CP=cumulative proportion of cocoa farmers; TI=total income; PS=proportion of income; CPTS=cumulative proportion total income.

Lonrez curve for the distribution of cocoa farmers

The Lorenz curve in Figure 2 shows the disparity in income distribution among the cocoa farmers as measured by the difference between the line of perfect equality and the actual income distribution line. It was revealed that 20.0% of the cocoa farmers earned less than 10.0% of the total income, while about 50.0% of the cocoa farmers earned just 20.0% of the total income made by the entire respondents in the study area. It was also revealed that 80.0% of the cocoa farmers earned about 49.5% of the total income, while the top 20.0% of the cocoa farmers accounted for a larger proportion (50.5%) of the income in the study area.
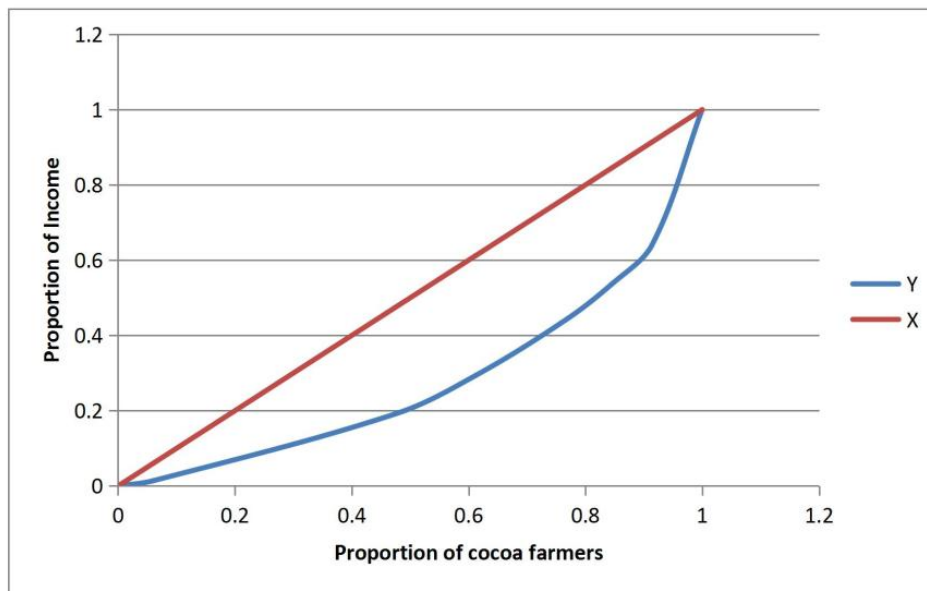
Figure 2: Lonrez curve for the distribution of cocoa farmers

Gini coefficient (GC) = 1 – 0.36 = 0.64
Index of Dissimilarity (ID) = 0.78

Determinants of income among cocoa farmers

Table 2 presents the determinants of income among cocoa farmers in the study area. Four functional forms were fitted. Out of the four functional forms fitted, the semi log functional form was selected as the lead equation since it was the one that has the best fit considering the number of significant variables and the value of the coefficient of multiple determinations (R^2). It was revealed that household size, farming experience and farm size is significant factors that determined the income of cocoa farmers in the study area. The coefficients of these variables are found to be significant at 1% level of significance. Other factors that significantly determined the income of cocoa farmers in the study area include: age of the cocoa farmers, cost of labour and amount of credit obtained. The coefficients of these variables were found to be significant at 5% level of significance. It was further revealed that a negative relationship exists between age of the cocoa farmers and their income (β= -0.015) in the study area. This implied that income of the cocoa farmers reduces as their age increases (i.e. as they grow old). This suggested that the productivity of the farmers reduces as they grow old. This will however result in reduction of their income. Similarly, the amount of credit obtained ($\beta = -4.517 \times 10^7$) and the cost of labour ($\beta= -2.459 \times 10^6$) were also found to have a negative relationship with the income of cocoa farmers in the study area. This suggests that increase in labour cost reduces the income of the cocoa farmers, while increase in the amount of credit obtained by the farmer will reduce the income of the cocoa farmers since the repayment of the interest on the credit and the principal will reduce the total income that accrues to the farmer. Furthermore, it was revealed that the coefficients household size (β =0.123), farming experience (β=0.018) and farm size (β=0.040) were found to have a positive relationship with income of the cocoa farmers in the study area. This implied that increase in the household size increases the income that accrues to the cocoa farmers at the end of the production season. This might be attributed to the fact that farmers will make use of the large household size as farm labour and therefore spend less on the acquisition of hired labour. This will reduce the cost of labour incurred and ultimately culminate in increase of the farmer's income. Similarly, increase in cocoa farming experience, as well as increase in the farm size increases income of the cocoa farmers. This suggests that more experience leads to better production methods and practices that will increase production. Also, increase in the size of the cocoa farm will increase the quantity of cocoa beans produced. This will therefore lead to increase in the income of the cocoa farmers. The adjusted coefficient of multiple determination (R'= 0.694) implied that 69.4% of the variation in the income of cocoa farmers is determined by the independent variables included in the model. The remaining are however due to random error (ϵ).

Table 2: Determinants of income among cocoa farmers

Variable	β	Standard Error	t-value
Age	-0.015**	0.007	-2.010
Sex	0.179	0.191	0.936
Marital status	0.013	0.106	0.120
Educational level	0.018	0.012	1.553
Household size	0.123***	0.020	6.286
Farming experience	0.018***	0.006	3.128
Farm size	0.040***	0.009	4.478

Cost of labour	-2.459 x 10^6**	0.000	-2.014
Amount of credit obtained	-4.517 x 10^7**	0.000	-2.182
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R=0.851; R^2= 0.723; ADJ R^2= 0.694; F-value = 24.727
Source: Field Survey, 2018

Contribution of the determinants to the inequality level of cocoa farmers

Table 3 presents the factor inequality weight of the variables. As a whole, the included variables explained 69.4% of the inequality in income of cocoa farmers, and this equivalent to the value of coefficient of determination (R^2). All the variables have positive signs accept the marital status and amount of credit obtained. The positive means that the variables are income inequality increasing whereas the negative means that the variables are income inequality decreasing. The study concluded that farming experience, farm size and household size to be the major inequality increasing factors with their consolidated shares of12.9%, 6.2% and 4.1% respectively.

Farming experience: The wide gap in the level of experience of the cocoa farmers accounted for 12.9% of inequality in income distribution among the respondents in the study area. This might be attributed to the fact that the highly experienced cocoa farmers earned far more than the inexperienced cocoa farmers, therefore farming experience contributed significantly to the widening inequality in income distribution among the cocoa farmers.

Farm size: Farm size was found to contribute 6.2% to income inequality among the cocoa farmers in the study area. This might be attributed to high cost incurred in cultivating large farm size compared to small farm size. This implied that farm size contributed to income inequality.

Household size: Household size contributed 4.1% to income disparity among cocoa farmers in thestudy area. This might be due to variation in their household size, farmer with large household willincurred more cost than those with small household size. This implied that household size is income inequality increasing factor.

Age: Age of the farmers was found to contribute about 1.5% to income inequality among the cocoa farmers. The implication of this is that majority of the farmers are not full of strength to carry out necessary operations in cocoa production, they incurred more cost on labour.

Educational level: Educational level contributed 0.45% to income disparity among cocoa farmers in the study area. This might be attributed to the fact that majority of the farmers with no formal education may earn less compared with those that are educated due to their ability in record keeping and bargaining with buyers. This implied that educational level contributed less to income inequality.

Sex: Sex contributed about 0.04% to the widening of disparity in income distribution among the cocoa farmers in the study area. This might be attributed to the fact that given that all things being equal, the male cocoa farmers earned slightly more than their female cocoa farmer counterparts in the

study area. This implied that sex contributed less to income inequality among the cocoa farmers in the study area.

Access to extension agent: Access to extension agents was found to contribute 0.028% to income inequality among cocoa farmers. This might be attributed to their level of acceptance to innovation. This implied that access to extension agents contributed less to income inequality.

Marital status: It was also revealed that marital status of the farmers reduces income inequality by0.01%. This implied that increase in the number of cocoa farmers that are married will reduce income inequality among the cocoa farmers in the study area. This suggested that marital status is income inequality reducing factors among the cocoa farmers in the study area.

Amount of credit obtained: The amount of credit obtained reduces income inequality by 3.2%. This implied that increase in the amount of credit obtained by the farmers will reduce income inequality among the cocoa farmers in the study area. This suggests that amount of credit obtained is income inequality reducing factors among the cocoa farmers in the study area.

Table 3: Contribution of the determinants to the inequality level of cocoa farmers

Variable	βi	SD of Xj	Corr. of (Xj, LnY)	FIW
Age	-.0.015	10.42	-0.018	0.015405
Sex	0.179	0.23916	0.107	0.000422
Marital status	0.013	0.43601	-0.092	-0.0001
Educational level	0.018	3.88022	0.065	0.004481
Household size	0.123	2.18726	0.229	0.040917
Farming experience	0.018	13.36646	0.171	0.129947
Farm size	0.04	5.11425	0.44	0.062252
Cost of labour	-2.459×10^{6}**	34435.35	-0.161	0.012843
Amount of credit obtained	-4.517×10^{7}**	243752.4	0.339	-0.03222
Access to extension agents	0.009	0.45716	0.1	0.0000285
LnY		0.73792		
Unexplained Variation (1-R^2)				0.306

FIW: Factor Inequality Weight
Source: Field Survey, 2018

CONCLUSION AND RECOMMENDATIONS

It can be concluded from this study that there was uneven distribution of income among cocoa farmers, with the result of the Gini-coefficient and index of dissimilarity. The research revealed that marital status and amount of credit obtained by the farmers are the major income inequality reducing factors while age, sex, educational level, household size, farm size, farming experience and access to extension agents are the major income inequality increasing factors. Arising from the findings of this research, the following recommendations were made to improve income distribution among cocoa farmers, increase income generating ability of the households and consequently boost cocoa production in Ondo State in particular and Nigeria in general.

1. Policy makers and government should concentrate on measures to increase cocoa productivity such as price stability, improved cocoa seedlings and good road network.

2. Increase in farm size should be encouraged by government and community leaders to further help in increasing the income of cocoa farmers in Ondo State and Nigeria.

3. Credit should be made available for cocoa farmers with little or no interest rate by government and private organizations because it was revealed to have a significant effect in reducing inequality among cocoa farmers and also lead to optimizing production.

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