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Determinants of Food Insecurity Status among Cocoa Farmers in Ondo State, Nigeria

Dada, O.A.[1)], .O.A. Taiwo[1)], K.A. Oluyole[1)], Y.O.M. Oladokun[1*)], and D. Awodumila[1)]

[1)]Economic and Extension Department, Cocoa Research Institute of Nigeria, Ibadan, Nigeria
[*)]Correspondence: yomoladokun@gmail.com
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Abstrsct

Food insecurity is a lack of consistent access to enough food for every person in a household to live an active and healthy life. This can be a temporary situation for a family or can last a long time. Food insecurity is one way to measure people's food affordability. The aim of the study was to determine factors that affect food insecurity status among cocoa farming households in Ondo state, Nigeria. Multi-stage random sampling technique was used to select the respondent farmers for the study. The first stage was the purposive selection of three Local Government Areas (LGAs) from the State. Second stage was the random selection of 15 cocoa producing communities from the three selected LGAs (the selection was proportional to size), while the third stage was the random selection of 400 cocoa farming households from the selected communities. Data were collected with the use of structured questionnaires and analyzed using descriptive statistics and Probit regression analysis. Results revealed that the majority (73.8%) of the respondents were males, out of which 84.2% were literates with at least primary school education, while (93.7%) of the respondents had enough farming experience of more than 10 years. The major significant variable determinants of food insecurity in the study area were total household income, age, household size, level of education, membership of cooperative, access to credit and farm size. It is therefore recommended that farmers should be granted more access to credit facilities at low interest rates as this further guarantees their food security.

Keywords: Food insecurity status, cocoa, farming household, credit facilities

INTRODUCTION

Food security is a multi-dimensional concept that has evolved over time and space, but the concern on food insecurity became an issue in the mid 70s due to the international food problem. The food security focus was macroeconomic in nature and mainly concerned with ensuring the availability of food and price stability. Food security was measured through food supplies (FAO, 2020). There are more than 200 definitions and 450 indicators of food security. The most common definition today was in 1996 agreed upon by most governments and non-governmental development agencies (FAO, 2016)

Food security at global levels has often been focused on the supply side of the food equation and the ability of a country to provide enough food to meet the needs of her population (Pinstrup-Andersen, 2009; Sassi *et al*., 2018). On the other hand food insecurity is among one of the problems facing Nigeria cocoa farmers. The level of food insecurity has continued to rise since the 1980s. It rose from 18% in 1986 to 41% in 2009 (Oluyole, 2013; Hashmiu *et al.,* 2022). About two hundred

and five million people in 45 countries of the world are in food security crises (FSIN & GRFC, 2022). To this end, the world leaders met and made a commitment to decrease the number of food-insecured people some years ago.

Structural factors or food insecurity include poverty and inconsistent government policies. It has been reported that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world (FAO, 2012; Enilolobo *et al*., 2022). Food insecurity in developing countries is the inability of people to gain access to food due to widespread poverty and unemployment (this prevents assured access to food supplies). Global food prices have risen dramatically in the last few years and are expected to rise further (FAO, 2011; Ayinde *et al*., 2020). Food price volatility has exerted pressure on global food security, and many depend on the market for their food supply. In general, a household can be said to be food secured only if it has protection against all kinds of food insecurity. The access to food over the long term should be nutritionally adequate and should be able to cope with short-term changes without sacrificing the nutritional needs of any of its members.

The supply of food may be from current production and stocks from previous production whereas the need has to be determined on the basis of nutritional requirement of a given society for a certain period of time usually a year or a day (Hoddinot, 1999; Wijerathna-Yapa & Pathirana, 2022). The methods used to measure household food securities are food availability, food accessibility and food utilization indicators. These indicators embrace information on natural resources, agricultural production data, marketing information, food balance sheet, sales of productive assets, diversification of income sources and household budget expenditure.

The crop, cocoa, is a valued crop that is highly demanded in the world markets for the manufacturing of beverages, liquor, cocoa powder, confectionery, wine industries, cosmetics and drugs (Esobhawan *et al.,* 2014). It is produced in 18 states of the country with Ondo State as the leading producer. The total national output of crop stood at 329, 870 MT with Ondo State accounting for 86,010 MT or 20.6% of the total (329.870 MT) during the 2014/2015 production season (CCAECS, 2015). However, according to the statistics, the 329,870 MT produced during the 2014/15 production season fell short of the 333,330 MT produced during the 2013/2014 season, a decrease of 1.44%. Also, according to CBN (2013; 2014) the growth rate of cocoa production in Nigeria decreased from 8.9% in 2012 to 4.7% in 2013 and to 3.4% in 2014. In the statista report Nigeria produced approximately 238 thousand tons of cocoa beans in 2012/2013 and is expected to produce about 270 thousand tons in 2023/2024 (www.statista.com). All these statistics indicate that there is a problem in the growth of output of cocoa in Nigeria with its attendant effects on the decrease in the farmer's income and the Nation's foreign exchange earnings. These have raised the question on how these farmers have been coping in terms of income and food consumption.

Moreover, according to Oluyole (2009) and Alhassan (2021), cocoa farming households in Nigeria had to grapple with the problem of food insecurity due to the fact that cocoa farmers do not have well established farming system with cocoa cultivation. The reason being that the shade that is being provided does not allow food crops under it to do well (Ojo, 2005; Ayeni & Adewumi, 2023). Apart from this, cocoa farmers in Ondo State devote almost all their time for the cultivation of cocoa with no time left for the cultivation of food crops. The effect of all these is food shortage among cocoa farming households

and this calls for empirical investigation to know the extent of food insecurity in the study area. This study therefore finds it quite imperative to determine the food insecurity status among rural cocoa farming households to ascertain its severity and the coping strategies adopted by the farming households, since it is a well fact that the average tropical African suffers from undernutrition and malnutrition and that annual increases in food production fail to cope with increases in demand arising from higher rates of population growth, (Ojo, 2005; Ayeni & Adewumi, 2023). It is better to look and define the empirical causes of food insecurity problems among cocoa farming households in the study area. To this end, it is important to determine the food Insecurity Status among Cocoa Farmers in the study area.

The objectives of the study are to determine the socio-economic characteristics of the cocoa farmers in the study area; to analyze the food insecurity status of cocoa farming households; and to determine the factors responsible for farming household's food insecurity in the study area

MATERIALS AND METHODS

Study Area

The study was carried out in Ondo State, Nigeria. The state is located in the south western geographical zone of Nigeria. The state was created out of the defunct western state of Nigeria on the 1st of October, 1976. Ondo State is bounded on the east by Edo and Delta States, on the west by Ogun and Osun States, on the north by Ekiti and Kogi States, and to the south by the Blight of Benin and the Atlantic Ocean. It is situated between latitude 4° 15'E and 6° 00'E of the Greenwich meridian and latitude 5° 45'N of the equator in Southern Nigeria. The state has 18 Local Government Areas (LGAs), out of which, 15 LGAs produce cocoa. The state has a population of 3,440,000 with a land mass of 14,606 km^2. The rural population constitutes about 1.7 million of the total population (NPC, 2006).

Sampling Technique

Primary data were collected through the administration of well- structured questionnaires

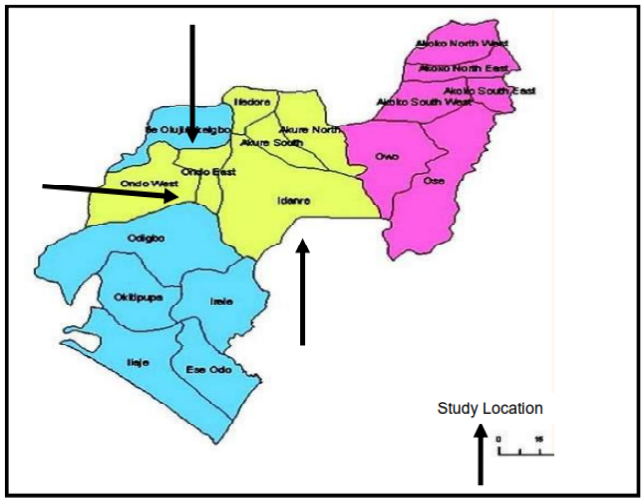

Figure 1. Map of Ondo State indicating the study location where questionnaire were administered
Source: Akinbolati *et al.* (2016)

in the three predominantly cocoa producing Local Government Areas of Ondo state. A multistage sampling technique was used in the study. The first stage was the purposive selection of three (3) local government areas, these are high cocoa producing LGAs in Ondo State and they are Idanre, Okeigbo/Ile-oluji and Ondo East LGAs. The second stage was a random selection of 15 communities from the study area with 5 communities from Idanre, 7 from Okeigbo/Ile-oluji and 3 commu-nities from Ondo East. The third stage was the selection of 400 cocoa house-holds from the selected communities. How-ever, both the communities and households were selected proportionate to size.

Determination of Sample Size

The determination of sample size is given by the formula as obtained from Kothari & Garg (2014) and specified as:

$$n = \frac{N}{1 + N(a^2)2} \quad \text{..... (1)}$$

Where:

n = Sample size
N = Population of the farmers
1 = Constant
α^2 = Level of significance or precession (which is 5% for this study)

Applying this formula for the farmers' population of 376,672 and a level of precision of 0.05, gave a sample size of 400 farmers approximately for the study.

Proportional approach was then used to determine the allocation of respondents to the communities. This approach is specified as:

$$ni = \frac{Ni}{N} X \frac{n}{1} \quad \text{..... (2)}$$

Where:

ni = Sample size of each community
Ni = Population of each respondents
N = Total population of the respondents
n = Sample size of all the respondents

The procedure is contained in the Table 1.

Table 1. Sampling procedure used for the study

LGAs	Communities	Population (N)	Sample (ni)
Idanre	(1) Owena Ayetoro	25,504	27
	(2) Alanika	24,335	26
	(3) Aponmu Idanre	26,401	28
	(4) Tejigbola	25,530	27
	(5) Olorunsogo	27,254	29
	Total	129,024	137
Okeigbo/Ile-oluji	(1) Bankemo	23,825	25
	(2) Okuopolo	22,317	24
	(3) Sama	23,415	25
	(4) Orisunmibare	25,031	27
	(5) Oke-Odo	23,223	25
	(6) Ajowa	30,325	32
	(7) Oke Ako	24,754	26
	Total	172,890	184
Ondo East	(1) Owena Bridge	24,919	26
	(2) Ago Elesin	25,540	27
	(3) Bolorunduro	24,299	26
	15	74,758	79
Grand total		376,672	$\sum ni = n = 400$

Source: ADP

Analytical Technique

Data collected were analyzed using descriptive and inferential statistics. Descriptive statistics involving the estimation of frequency, percentage, means, and standard deviation was used to describe the socio-economic characteristics of cocoa farming households.

The inferential statistics was used to analyze objective II and it was based on the adoption of food security index (z) which determined the extent of food insecurity status of the respondents. This classified cocoa farming households into food secure and food insecure. This procedure was the adap-tation of the work of Babatunde *et al.* (2007) and it determined the food insecurity status of each household based on the food security line (z) and using the recommended daily calorie required approach. A household whose daily per capita calorie intake is up to 2260 kcal will be regarded as food secure, while those below 2260 kcal will be regarded as food insecure households.

The households' calorie intake was obtained through the households' consumption. The quantities were converted to gram and the calorie content was estimated by the food commonly eaten in Nigeria. This was obtained from the use of adult equivalent scale tables (Table 2) as well as the use of kilocalorie tables (Table 3) of the foods consumed in the study area.

The functional forms are as follows:

$$Z_i = Y_i/R \quad \text{..... (3)}$$

Where:

Z_i = Food security status of i^{th} households

Y_i = Daily per capita calorie intake of i^{th} household.

R = Recommended per capita daily calorie intake (2260 kcal)

Z_i = 1 for Y_i greater than or equal to R.

Z_i = 0 For Y_i less than R and 1 for Y_i equal to or more than R

The probit regression model was used to analyze the factors that determine the factors responsible for farming household's food insecurity in the study area.

The probit regression *functional* forms are as follows:

$$P_{ij} = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i} + \beta_7 x_{7i} + \beta_8 x_{8i} + \beta_9 x_{9i} + \beta_{10} x_{10i} + \beta_{11} x_{11i} + \beta_{12} x_{12i} + \beta_{13} x_{13i} + \beta_{14} x_{14i} + Ui \quad \text{..... (7)}$$

Table 2. Adult equivalent scale for adjusting the household size

Age category (years)	Male	Female
0-1	0.33	0.33
1-2	0.46	0.46
2-3	0.54	0.54
3-5	0.62	0.61
5-7	0.74	0.70
7-10	0.84	0.72
10-12	0.88	0.78
12-14	0.96	0.84
14-16	1.06	0.86
16-18	1.14	0.86
18-30	1.04	0.80
30-60	1.00	0.82
> 60	0.84	0.74

Source: NBS (2010)

Where:

P_{ij} = Household food insecurity status,
X_1 = Farming as main occupation ,
X_2 = Marital status of farmer,
X_3 = Fertilizer usage
X_4 = Gender of farmer
X_5 = Household size
X_6 = Years of formal education;
X_7 = Farming experience (years);
X_8 = Age of farmer (years);
X_9 = Income from farm;
X_{10} = Farm size (hectares);
X_{11} = Off farm income;
X_{12} = Output of crops (equivalent per kg);
X_{13} = Belonging to social group
X_{14} = Non-food items expenditure
U = Error term
^{2}s = Vector of the parameter to be estimated
I = i^{th} number of the respondent with i = 1, 2, 3 ……..400.

RESULTS AND DISCUSSION

Results on the socio-economic characteristics showed that, the age distribution of respondents (Table 3) fell within the age bracket of 41-50 years. The result indicated that the farmers were mostly adults with experience in farm work and within the productive age (Oluwo, 2009; Basorun, 2010; Ogunyemi, 2013).

The distribution by sex, shows that majority (73.8%) of the respondents were males while the females constituted (26.2%). This implied that male dominated cocoa farming sector in the study area. This finding is in line with Oluyole (2011), who attributed the dominance of the males over the females in cocoa production. The results also show that, the distribution of the households by marital status (86.8%) were married. Which may influence them having larger households, thus may in turn make more hands available for farming operations that increase production. Table 3 also revealed that 28.3% of the respondents had 21 to 30 years of farming experience, while 6.30% had less than 10 years and 19.10% had 11-20 years of farming experience. Similarly, 20.30% and 14.0% had farming experience of 31-40 and 41-50 years respectively. The mean years of experience in cocoa farming was 32 years, indicating that they were not new to cocoa farming. The implication is that the respondents would have regarded the enterprise as enduring and sustainable which could have offered them opportunities to adopt strategies to cushion the problem of food insecurity. The household size provided information on the food insecurity status and its dependency. Table 3 revealed that 44% of the households had 5-8 members, 14.25% had 1-4 members while 41.75% of them had more than eight members. The mean household size of 8±3 persons indicated that they had large households which may have a negative effect on their food status and increase their probability of being food insecure.

Most of the cocoa farmers were found to be educated (84.2%), where (84.2%) had formal education, while 15.3% of them had no formal education. This may enhance their access to specific information and knowledge on improved farm practice thereby increasing their food production techniques and hence improving their food security status. Land is one of the limiting inputs in agriculture, Greenland & Nabben, (2001). This limits farmer's ability to cultivate large farm holdings. The result, revealed that the farmers were not large scale farmers, having a mean farm size of six hectares. The respondents had serious land constraints to operate large scale cocoa farms and thus affecting their food security. The distribution of respondents by their estimated total household income as shown in Table 3, reveals

Table 3. Socio economic characteristics of respondents

Variable	Frequency (N = 400)	%
Age		
≤30	16	4.0
31-60	220	55.0
>60	164	41.0
Mean = 58±15.6		
Sex of Household Head		
Male	226	73.8
Female	105	26.2
Marital Status		
Single	20	5.0
Married	347	86.8
Divorced	9	2.2
Widow	24	6.0
Household Size		
1-4	57	14.3
5-8	176	44.0
9-12	138	34.5
≥13	29	7.3
Mean = 8±3.5		
Educational Level		
No formal education	63	15.8
Primary	130	32.5
Secondary	153	38.2
Tertiary	54	13.5
Farm Size		
<4	111	27.8
4.0-8.9	184	46.0
9.0-12.9	82	20.5
≥13	23	5.8
Mean = 6±3.5		
Farming Experience		
≤10	25	6.3
11-20	78	19.1
21-30	113	28.3
31-40	81	20.3
41-50	55	14.0
>50	48	12.0
Mean = 32		
Membership of Cooperative Society		
Cooperative member	306	76.5
Non cooperative member	94	23.5
Total Annual Income ($)		
≤900	11	2.80
901–1800	102	25.50
1801–2700	149	37.20
2701–3600	100	25.00
>3601	38	9.50

Source: Field survey, 2017.

that majority about (72%) of them were earning US$ 1800 and above per annum, 25.5% of them were earning US$ 901 to US$ 1800 per annum while 2.75% were earning less than US$ 900 per annum. The average annual income of the respondents in the study area was US$ 2553. It therefore implied that most of the sampled respondents earned above GL 06 in the public service. This finding could lead to the assumption that the respondents could have financial resources to back food purchases and therefore, they might be food secured.

Analysis of Food Insecurity Status among Cocoa Farming Households

Table 4 presented the summary statistics and food security indices among the sampled households. Based on the daily calorie (R) of 2260 kcal, it was observed that 55.0% of the households were food secure while 45.0% were food insecure. The average household daily per capita calorie intake for the food insecure and food secure households in the study area were 1845.63 kcal and 2964.60 kcal respectively. This shows that food insecure households consume lesser calorie to what is considered as minimum required calorie (2260 kcal) while the average calorie intake for food secure households was 2964.60 kcal which is higher than the minimum required calorie required for human development.

The food surplus/shortfall index (P), which measures the extent of deviation from the food security line, shows that the food secure households exceeded the calorie requirement by 31%, while the food insecure households fell short of the calorie required by 18%. Also, the mean household size of the adult equivalent was 6.35 for the food secure households and 9.92 for the food insecure households. This is in line with a priori expectation that larger households are likely to be food insecure.

Food security index (FSI) for the food secure households in the study area was calculated to be 1.31 while it was 0.82 for the food insecure households. Also, the average household size for the population was 8 persons; while the food secure households have an average household size of 6 and the food insecure households have average size of 10 persons.

Determinants of Food Insecurity Status

The result of the determinants of food insecurity in cocoa farming households as shown on Table 5 Revealed a coefficient of determination (R^2) of 0.87 and an f-statistics that is significant at 1% indicating that 87% of the variables included in the model jointly explain the dependent variable. The model used is therefore of a good fit.

Age

The results revealed that the coefficient of age of household head was significant at 5% and has a negative effect on the food security status. This indicated that, the higher the age of cocoa farming households, the higher the probability of being food insecure. The marginal effect of -0.028 shows that, if the age of cocoa farming households

Table 4. Summary of Food Security Index (FSI) for cocoa farming households in the study area

Variables	Households status	
Food security indices	Food secure	Food insecure
Recommended per-capita calorie	Intake (I) 2260 kal	
No of household	220	180
Percentage of household	55.0	45.0
Mean of household size (adult equivalent)	6.35	9.92
Mean household daily per capita calorie consumption(kcal)	2964.60	1845.63
Food Security Index	1.31	0.82
Shortfall Index	-	0.18
Surplus Index(P)	0.31	-
Head count ratio (H)	0.55	0.45

Sources: Field data, 2017.

increases by one unit, the probability of food insecurity would increase by 2.8%.

Household Size

The household size was statistically significant at ($p \leq 0.05$) with a negative effect on the food insecurity status. The higher the household size, the higher the probability of food insecurity. The value of -0.017 implies that an increases by one unit of household will result in 1.7% food insecurity. Large household size exerts more pressure on food consumption

Educational Status

The educational status has a positive coefficient at ($p \leq 0.05$), households head that are educated were more likely to be food secure than the uneducated. The value of 0.037 implies that, if the household head educational level is decreased by one unit, the probability that cocoa farming households would be food insecure by 3.7% and vice versa. This finding corroborates with the findings of Haile, 2005 who asserted that the level of education positively affects income earning and managing household's food resources.

Total Income

Total income was significant at ($p < 0.01$) with a positive effect on the food insecurity status.This implies that the higher the total income, the higher the probability of cocoa farming households being food insecure. This is because even though the income of the farmer may increase, it is not likely that the farmer is spending the money to buy food, rather he might prefer spending the money on non-food activities, like children's education and marriage which might result to shortages of food within the households and hence make the households to be food insecure. With this the household would be food insecure. The marginal effect value of 0.00011 implies that a unit decrease in household income decreases the probability of being food secure by 0.011%. This variable is an important factor in determining food insecurity status of cocoa farming households in the study area since money will be used to buy food. This conforms to the findings of (Oluwatayo, 2008; Aminu *et al*., 2021)

Membership of Cooperative Society

The membership of cooperative societies was statistically significant at 1% and had a positive effect on the food security status of cocoa farming households. This means that, the higher the household head participation in cooperative society, the higher the probability of being food insecure. Hence, this is because as farming household members of a cooperative he may not be playing an active role, hence, he may likely not be enjoying the benefits that are needed to increase his or her production. Thus, the effect of this is food insecurity. The lower the participation of household heads in cooperative activities, the lower the probability of being food secured. The marginal effect of 0.363 implies that a unit decrease in active participation of household in cooperative activity increases the probability of being food insecure. The study also reveal that the farm size, access to credit facilities are significant factors (1% level of significance) that affects food insecurity and they are positively related to food insecurity in the study area.

Access to Credit

This variable was statistically significant at 1% ($p \leq 0.01$) with a positive effect. This implies that the more access to credit through

cooperatives, banks or other means, the more likely cocoa farmers would be food insecure and vice versa. The marginal effect value of 0.170 implies that, if access to credit increases by one unit, the probability of households being food insecure would decrease by 17%. This is because in the study area most of the farming households are educated and despite their access to credit they may not likely to spend it on food items of the moment rather than spend it on non-farm items, such as children's education. The result of this is food insecurity.

Farm Size

Farm size was found to be statistically significant at 1% ($p < 0.01$) and had a positive effect on food insecurity status of the cocoa farming households indicating that the larger the farm sizes, the higher the probability of being food insecure and vice versa. This is so because, though the farm size is large, the substantial proportion of the farm might be used to plant cocoa at the detriment of food crops, thus making food availability within the households to be drastically reduced. Also, the money that is being made from cocoa production might not be used for purchasing food items, rather it might be used on other areas such as children education, building houses and this action is also likely to result into food shortages within the household which may make the greater proportion of the households to be food insecure. The marginal effect of 0.15 implies that a unit decrease in the size of a farm would result in an increase in the probability of being food insecure by 15%. Despite the fact that the farm size may be high or increase the effective hectarage may be very low and this is likely to result in food insecurity. Hence as farm size increases food insecurity also increases.

Table 5. Determinants of food insecurity status on cocoa farming households

Socio-economic variable	Marginal effect coefficient	P>μ	Z-Value
Age	-0.0285 **	0.042	-2.03
	(0.014)		
Marital status	0.749 **	0.049	1.97
	(0.380)		
Extension visit	0.154	0.305	1.03
	(0.150)		
Education	0.376 **	0.008	2.66
	(0.141)		
Farm size	0.1518 ***	0.001	3.02
	(0.050)		
Household size	-0.213 ***	0.001	-3.92
	(0.054)		
Membership of cooperative	0.363 ***	0.009	2.63
	(0.138)		
Total income	0.000112 ***	0.001	4.87
	(0.000023)		
Access to credit	0.1708 ***	0.001	4.41
	(0.038)		
Distance to market	0.292	0.099	1.65
	(0.177)		
Farming experience	0.155	0.257	1.13
	(0.137)		
Gender	-1.078	0.311	1.04
	(0.391)		
Constant	4.46		
Chi-square	444.63		
Pseudo R^2	80.7		
No of observation	400		

Notes: Figures in parenthesis means standard error, *** and **were significant level at 1% and 5%.

The study further revealed that though extension visit, gender, marital status, farming experience and distance to market, positively influenced food status in the study area, they were however not significant at 5% level of significance. This implies that a unit increase in any of these variables would decrease the probability of cocoa farmers being food secure.

CONCLUSIONS

Most of the farmers are male, married and are educated. They have a fairly large household size and have land constraints. Fifty five percent (55.0%) of the respondents in the study area were food secure. The major determinants of food insecurity in the study area were total household income, age, household size, level of education, membership of cooperative, access to credit and farm size. Majority of the farmers under study lacked access to credit and input. Credit at a low interest rate and input should be made available to cocoa farmers in the study area in order to improve their productivity and their food status. Harnessing the potential role of coping strategies currently practiced by the households during food shortages to mitigate food insecurity should be considered and incorporated as policy options. More cocoa farmers should be encouraged to form and join viable cooperative societies in order to access financial assistance at concessional rates, obtain goods and services at low prices, thereby, improve their standard of living.

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