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Effect of cooperative societies on food security status of cassava farming households in delta state, Nigeria

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ABSTRACT: In Nigeria, there is growing interest in establishing sustainable food security, and much effort has gone into identifying an effective mechanism for coordinating the efforts of thousands of small-scale farmers to ensure food security. The goal of the study was to evaluate the effect of agricultural cooperative societies on the level of food security among cassava farmers' households in central agricultural zone of Delta State, Nigeria. A multistage sampling method was used to select 180 respondents. The information gathered was analyzed using descriptive statistics, the FGT food security index, and a binary logistic model. Only 42% of non-cooperative farming households were food secure, compared to 66% of cooperative farming households. The food insecurity incidence (0.58), depth (0.21), and severity (0.10) for the non-cooperative farmers were higher than that of the cooperative farming households (0.34, 0.11, and 0.04 respectively). Incidence of food insecurity was high among household heads within the age bracket of 41-50 years (76%) for the non-members and 51-60 years (47%) for the members. Additionally, households headed by men, as well as those with large families and low incomes, were most significantly affected by food insecurity. Furthermore, the age of the household head, household size, cooperative membership, and household income were significant determinants of food security. It is therefore concluded that cooperative societies significantly improve the food security status of their members, as the number of households with food security was higher in the case of members than the non-members. Farmers should be urged to become members of existing cooperative societies.

Key words: Cassava, cooperative societies, food security, insecurity depth

Food is regarded as a necessary component of life and provides energy, sustenance, and nutritional wholeness. A healthy and productive existence depends on getting ample food with regard to amount and quality. Food is crucial for supporting life because it gives us the nutrients, we need to stay healthy, feel better, and work more productively. Food security is a state in which everyone, at all times, has physical, social, and financial access to enough, safe, and nutritious food to suit their dietary needs and food preferences for an active and healthy life (FAO, 2002).

Food security was defined by the World Food Security Committee "as physical and economic access to adequate food by all household members without undue risk of losing the access" (Omonona and Agoi, 2007). Food security has been defined as the availability, accessibility, utilization, and stability of food (Okuneye, 2002; Amaza *et al.*, 2006). Food availability indicates that there is adequate safe and wholesome food produced in the country or sourced

from other countries. Individuals or families must have sufficient purchasing power or ability to acquire quality food at all times for food to be accessible, while utilization necessitates sufficient quality and quantity of food intake (Omonona and Agoi 2007). In a broader sense, these elements of availability, accessibility, and utilization entail the supply, demand, and sufficiency of food at all times.

Maintaining adequate food security remains a critical challenge for most rural households in developing countries, particularly in Sub-Saharan Africa. (Mutea *et al.*, 2019). Ironically, farming households especially smallholder farmers are the most affected in terms of food insecurity despite their contributions to the feeding of the rest of the population (Kuku-Shittuet *al.*, 2013).

Agriculture is the main source of livelihood for households in developing countries (Afodu *et al.*, 2020). Approximately two-thirds of rural households in Nigeria rely on agriculture and animal production

as their primary source of income. Because of the variability of the weather and the seasonality of agricultural production, these households are more prone to chronic food shortages, particularly during the post-planting season.

These cooperatives generate a significant amount of money not just by providing members with marketing opportunities, but also by attempting to boost their profit margins by bargaining for better prices. (Wanyama, *et al.*, 2008). In Nigeria, ninety-six percent of cooperative societies are primarily established to meet the necessities of agriculture (FMARD, 2001).

In recent years, the organization of cassava cooperative farmers has emerged as one of the key prerequisites for the efficient mobilization of production resources and the acceleration of farmers' development (Ekwere, 2016). Cassava is a significant tropical staple food (IITA, 2002) that significantly contributes to resolving the food crisis in Africa (Hahn, 1997). Cassava has gradually changed from a low-yielding famine reserve crop to a high-producing cash crop for both rural and urban customers (Nweke *et al.*, 2002), which suggests food security in Nigeria.

According to studies on cooperatives and food production (Ekwere, 2016), cooperatives facilitate cooperative members' access to technology and farm input and output markets, which has a favorable and significant impact on food production. Others have also observed the significance of cooperative societies on the farmers' welfare and their level of poverty (Agunbiade and Oke, 2019; Mukaila, 2020; Ajayi *et al.*, 2021). According to Agbo (1999), cooperative societies can help members achieve food security by giving them powerful negotiating power for loans and other services, creating a favorable environment for a more effective government aid program, improving member marketing opportunities, and offering services at significantly lower costs. Will this also be true for cassava farmers? Is this the case in Edo State? What is the household food security status among cassava farmers who are members of cooperative society and

non-members of cooperative society in the study area? What factors influence households food security in cassava farming households in the study area? This study addressed this by evaluating the food security status of cassava farming households of members and non-members of cooperative societies.

MATERIALS AND METHODS

The study was carried out in the Central Agricultural Zone of Delta State, Nigeria. Central Agricultural Zone of Delta State, is one of the three agricultural zones designated by the Delta State Agricultural Development Programme. Agriculture and agro-related activities are the major occupations of the people. The population in the study area consisted of cooperative and non-cooperative cassava farming households. The respondents for the study were chosen through a multi-stage sampling procedure. The first stage involved the random selection of three Local Government Areas (LGAs) (Ughelli North, Okpe, and Uwie LGA) out of the eight LGAs of the zones. In the second stage, five (5) cassava farmers' cooperatives were chosen from each LGA using a simple random sampling technique. The third stage involved the random selection of six (6) households from each selected cooperative society making a total of ninety (90) cooperative members. For non-members, thirty (30) cassava farming households were chosen randomly from each of the selected LGA, making a total of ninety (90) non-members. Primary data were obtained through the use of a structured questionnaire. Descriptive statistics summarize the socio-economic characteristics of households in the study area.

Estimation of food security index

The Foster-Greer and Thorbecke (FGT) class of decomposable poverty measure was selected to illustrate the food security status of the households, as used by Sani and Kemaw (2019) and Ogunniyet *al.* (2021). Households were classified into food

$$Fi_{ix} = \frac{\text{per capita food expenditure for the } i\text{th household}}{\frac{2}{3} \text{mean per capita food expenditure of all households}}$$

secure and food insecure households, using the food security index. The food security index was calculated by using the following formula:

Where:

Fi=food security status

When $F_i \geq 1$ =Food secure i^{th} household

$F_i < 1$ =Food insecure i^{th} household

Food expenditure was obtained by getting data on the total amount spent on food per household per number of persons to estimate the mean per capita food expenditure.

Consequently, a household is considered to be food secure if its per-capita monthly food expenditure exceeds or is equivalent to two-thirds of the mean per-person food expenditure. In contrast, a household is considered to be food insecure if its per capita food spending is less than two-thirds of the mean monthly per capita food expenditure.

To determine the factors affecting the farming households' level of food security, a binary logistic regression was utilized. The model was adopted because of the dichotomous dependent variables. The model in its implicit form is given as;

$$\text{Log}(Y) = \text{natural log (odd ratio)} \quad Y_i = \ln\left(\frac{p}{1-p}\right) = \beta + \beta_1 X_1$$

Where

Y = dependent variable (food security level; food secure = 1 and non-food secure = 0)

α = intercept

β = regression coefficients

X= independent variables

Explicitly the model is empirically stated as:

$$\text{Log } Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + e$$

Where Y = food security status of the i^{th} households sampled [1=food secure, 0= food insecure]

a = intercept, e = error terms,

$b_1 - b_8$ = regression coefficients

X_1 = gender of household head (Male =1, female =0)

X_2 = cooperative membership (member=1, non-

member=0)

X_3 = age of household head (in years)

X_4 = household size

X_5 = Education status (educated=1, not educated=0)

X_6 = access to credit (access=1, no access=0)

X_7 = Farm size (hectares)

X_8 = household income (Naira ₦)

RESULTS AND DISCUSSION

Socio-economic characteristics of Cassava farming households

The result (Table 1) shows that the average age of household heads was 50 and 42 years for non-members and members of cooperative societies respectively, indicating that they are within the active age range of 16 to 64 years. This is consistent with the findings of Irohibe and Agwu (2014); Ubokudom *et al.* (2017) with findings of 41 and 44 years as mean age of rural farmers in Kano State and Akwa Ibom State, Nigeria. The majority of the non-members and members farming households (77% and 81% respectively) were headed by males. This could be because men in Nigeria have easier access to farmland through paternal inheritance than women. (Ziervogel *et al.*, 2006). The high incidence of male household heads could be because of restricted access to farmland for females (Effiong, Ijioma, and Okolo, 2015).

The majority (69% and 61%) of the non-members and members respectively were married. They also had a mean household size of 4 and 5 persons per household respectively with about 54% of the cooperative non-members having a household size of fewer than 4 persons per household, while for the cooperative members about 49% had about 5 to 8 persons per household. Families with larger households have a higher likelihood of having ready labour available for farm activities. However, large households could also pose a risk to achieving family food security as suggested by Babatunde *et al.* (2007). The result also indicated that more (51%) of the non-members had no formal education, while about 39% had primary education and 10% had secondary education. For the cooperative members, the majority (90%) had formal education with

Table 1: Socio-Economic Characteristics of Respondents

Characteristic	Non-cooperative respondents			Cooperative respondents		
	Freq	%	Mean	Freq	%	Mean
Age of household Head(Range)						
<= 30	1	1.11	50	26	28.89	42
31 – 40	17	18.89		18	20.00	
41 – 50	34	37.78		27	30.00	
51 – 60	22	24.44		15	16.67	
61+	16	17.78		4	4.44	
Gender of Household Head						
Female	21	23.33		17	18.89	
Male	69	76.67		73	81.11	
Marital Status of Household head						
Single	4	4.44		27	30.00	
Married	62	68.89		55	61.11	
Widow(er)	18	20.00		6	6.67	
Divorced	6	6.67		2	2.22	
Household Size(Range)						
1 – 4	49	54.44	4	37	41.11	5
5 – 8	37	41.11		44	48.89	
9 – 12	4	4.44		9	10.00	
Educational level of Household Head						
No formal education	46	51.11		9	10.00	
Primary education	35	38.89		10	11.11	
Secondary education	9	10.00		20	22.22	
Tertiary education	0	0.00		51	56.67	
Access To Credit						
No	68	75.56		17	18.89	
Yes	22	24.44		73	81.11	
Farm size (Hectare)						
<= 1	85	94.44		57	63.33	
1 – 2	5	5.56		24	26.67	
3+				9	10.00	

(56.67%) having tertiary education as their highest form of education. This shows that the farmers received one form of education or the other. The findings also showed that the cooperative members had a higher level of education than the non-members' farmers. This suggests that educational attainment is a variable that could influence the subscription to the membership of a cooperative society.

The majority (94% and 63.33%) of the non-members and members respectively cultivated less than 1 hectare as farmland. About 27% of cooperative farmers had farm sizes ranging from 1.01-2.00 hectares, and 10% had farms larger than 3 hectares. This shows that they are small-scale farmers cultivating small-sized farmland. This finding is similar to the findings of Mgbenkaet *al.* (2015) who

observed that the majority of farmers in Nigeria (80%) cultivate fewer than 10 hectares of farmland. The result also shows that cooperative respondents cultivated relatively larger areas of farmland compared to the non-comparative farmers which could lead to higher production and food security. According to Akinsanmi and Doppler (2005), the size of farmland cultivated by a household has a direct impact on output and thus food security. The result presented in Table 1 also highlights that most (76%) of the non-cooperative farmers did not have access to credit, while 81% of the cooperative farmers had access to credit. This result shows that credit facilities are either unavailable or not accessible to non-cooperative members in the study area.

Services Provided by Cooperative Societies

The cooperative society's services to cassava farmers

Table 2: Services Provided by Cooperatives

Services	Member	
	Freq	%
Loan	81	90.00
Provision of inputs for farm	76	84.44
Educational training	64	71.11
Provision of food supply at a discounted rate	60	66.67

Table 3: Food security classification of respondents

Status	Non-cooperative		Cooperative	
	Freq	%	Freq	%
Food Insecure	52	57.78	31	34.44
Food Secure	38	42.22	59	65.56
Total	90	100.00	90	100.00

Table 4: Food Security Indexes of respondents

Status	Non-cooperative respondents	Cooperative respondents
	Mean	Mean
Mean Monthly per Capital Food Expenditure	6301.29	9959.81
Food Security Line	4200.86	6639.87
Food insecurity incidence (a=0)	0.58	0.34
Food Insecurity Depth index (a=1)	0.21	0.11
Food Insecurity severity Index (a=2)	0.10	0.04

in the study area are provided in Table 2. The result indicates that 81% of cooperative farmers received financial services in the form of credit advances, and about 84% of the cooperative farmers were provided with farm inputs, such as processing materials, equipment services, farm machinery, fertilizers, chemicals and improved stem. About 71% of the cooperative members received training in areas such as improved farming techniques such as weed, disease, and pest management, while about 67% of the cooperative farmers purchased food supplies at discounted rates from cooperative societies. This finding conforms to that of Okeke and Nwoye (2019) that cooperative societies engage in activities such as the provision of subsidized inputs, training of members on best agronomics practices, provision of low-interest loans and communal labour to rice farmers in Ayamelun Local Government Area of Anambra State, Nigeria.

Food Security Status of Cooperative Non-members and Members Cassava Farming Households

The food security classification of the household showed that above half of the respondents (58%) of the non-member farming households, and about 34% of the cooperative members farming households were food insecure because their monthly per capita food expenditure is less than two-thirds (2/3) of the average monthly per capita food expenditure (Table 3). This indicates that most of the non-member households in the area were food insecure. The result indicates that the cooperative members have better access to resources which could be a result of the services such as fertilizer and improved planting materials received from cooperative societies, that enable them to spend more on food thereby improving their food security status. This result follows apriori expectations, as cooperative respondents are more food-secure due to membership benefits, as earlier identified by Agbo (1999). The result is in accordance with that of Salman and Akinbosoye (2020), that cooperative farming households in Oyo State, Nigeria, had greater food security than non-cooperative farming households.

The food insecurity incidence, depth and severity are presented in Table 4. The result shows that the food insecurity depth for the non-cooperative household (0.21) was higher than that of the cooperative household (0.11). The food insecurity depth of 0.21 and 0.11 implies that the amount the household falls short of the food security line is 21% and 11% for the non-cooperative and cooperative farming households respectively. That is a non-member and cooperative member farming household would require 21% and 11% of the food security line respectively amounting to ₦882.17 and ₦730.39 to close the food security gap. This shows that the non-cooperative farming household would require more resources to achieve food security. The food insecurity severity of 0.10 and 0.04 indicates that 10% and 4% of the non-cooperative and cooperative farming households respectively are worse off than an average food insecure farming household, and could be regarded as the most (core) food insecure households.

Table 5: Food Security Headcount based on Respondents Socio-economic Characteristics

		Non-cooperative respondents		Cooperative respondents	
		Food secure	Food insecure	Food secure	Food insecure
Age range (yrs)	<= 30	0.00	1.00	0.58	0.42
	31 – 40	0.41	0.59	0.89	0.11
	41 – 50	0.24	0.76	0.63	0.37
	51 – 60	0.45	0.55	0.53	0.47
	61+	0.81	0.29	0.75	0.25
Gender of household head	Female	0.71	0.29	0.59	0.41
	Male	0.33	0.67	0.67	0.33
Size of household (range)	1 – 4	0.69	0.31	0.89	0.11
	5 – 8	0.11	0.89	0.55	0.45
	9 – 12	0.00	1.00	0.22	0.78
The educational level of the household head	Noformal education	0.48	0.52	0.33	0.67
	Primary education	0.66	0.34	0.60	0.40
	Secondary education	0.78	0.22	0.70	0.30
	Tertiary education	0.00	0.00	0.75	0.25
Farm size (range)	<= 1	0.42	0.58	0.58	0.42
	2 – 3	0.40	0.60	0.75	0.25
	3+	0.00	0.00	0.89	0.11

Table 6: Determinants of Respondents' Food Security

	Coefficient (b)	Std. Error	Wald chi-square	Df	Prob. level	Odd ratio
Constant	0.159	1.618	0.01	1	0.92	1.172
Sex	-0.824	0.541	2.323	1	0.13	0.439
Cooperative membership	1.574**	0.866	3.306	1	0.07	4.826
Age of Household head	0.08*	0.028	8.178	1	0.00	1.083
Household size	-0.879*	0.137	41.209	1	0.00	0.415
Educational level	0.323	0.29	1.244	1	0.27	1.381
Access to credit	0.038	0.561	0.005	1	0.95	1.039
Contact an extension worker	0.205	0.652	0.099	1	0.75	1.228
Farm size	0.508	0.456	1.24	1	0.27	1.662
Income	0.665**	0.386	2.97	1	0.09	1.944
PseudoR ²	0.634					

*Significant at 1% level,**significant at 10% level.

Food Security Headcount Based on Respondent's Socio-economic Characteristics

Results presented in Table 5 classified cooperative non-members and members farming households into food secure and food insecure according to their socio-economic characteristics. It shows 76% of the food-insecure households of the non-members were between the ages of 41 and 50 years while 47% of food-insecure households of the cooperative farmers were between the ages of 51 and 60 years. This result is similar to those of Abur (2014), The rural farming households in Guma Local Government Area, Benue

State, have a high rate of food insecurity among people aged 40 to 49. The food insecurity incidence result shows that the female-headed households (71%) were more food secure than the male-headed households (33%) among the non-members.

Contrary to apriori expectations, the female-headed household may achieve food security as a result of the fact that women play a significant role in food preparation and family care and are likely to spend the household income on food and family (Fortmann, 2009). This finding is in consonant with that of

Adekoya (2014) and Ogunniyi *et al.* (2021). For the cooperative members, the male-headed households (67%) have a higher proportion of food-secure households than the female-headed households (59%). This finding suggests that cooperative societies have a positive effect on their members' food security since cooperative farming households are more food secure than non-cooperative farming households. The results also indicated that the incidence of food insecurity was more prevalent in families with large household sizes than in those with small household sizes for both non-cooperative (89%) with a household size of 5-8 and cooperative farmers (78%) with a household size of 9 – 12. The reason as reported by Idrisa *et al.* (2008) could be that the larger the household, the greater the duties, especially when many of the household members do not earn any income and rely solely on the household head. This is in line with the findings of Idrisa *et al.* (2008), Abur (2014) and Ogunniyi *et al.* (2021), that larger household sizes had more incidences of food insecurity in Borno, Benue, and Ogun States respectively, Nigeria. Incidence of food insecurity is also more prevalent in families where the heads of the family have low level of education and in families where the head has no formal education which accounts for about half (52%) of the non-cooperative households and about 67% of the cooperative farming household. The incidence of insecurity is lower in households headed by people with some level of education such as those educated up to primary (34% and 40%) and secondary (22% and 30%) school level for the non-cooperative and cooperative farming households respectively. A similar result was observed for the cooperative farming household that had heads educated up to the tertiary educational level with a majority (75%) of the household achieving food security. This agrees with the findings of Amaza *et al.* (2006) and Abur (2014), which shows the higher the educational level of the head of the household, the higher the occurrence of food insecurity.

Factors Influencing Food Security Status among Non-Cooperative and Cooperative Farming Households

The logit regression result of the factors influencing

the food security status of non-cooperative and cooperative cassava farming households is presented in Table 6. The coefficient of the age of the household head, household size, cooperative membership, and household income were observed to be significant socioeconomic variables affecting the food security of the respondents. The coefficient of age (0.08) was positive and statistically significant at a 1% level of significance. This implies that an increase in age will increase the probability of the household being food secure. This may be a result of an increase in expertise gained over time. This conforms to the findings of Osuafor *et al.* (2020) that an increase in age increases the chance of the household being food secure for cassava processors in Anambra State. Household size has a negative coefficient (-0.879) that is also statistically significant at a 1% level indicating that a large household size increases the likelihood of the household being food insecure while a small household size increases the likelihood that the household will be food secure. This finding conforms with that of Irohibe and Agwu (2014), that household size is a significant determinant of household food security, however, reported that households with larger sizes are less likely to be food secure in Kano State, Nigeria.

Membership of Cooperative Society's coefficient (1.574) showed a positive coefficient and was significant at 10%. This implies that being a member of a cooperative society would enhance the likelihood of households being food secure. The coefficient for income was also positive and significant at 10%, this implies that an increase in the income of the household would increase the probability of the household being food secure. This is following the findings of Otunaiya and Ibidunni (2014) that cooperative membership has a positive and notable effect on the household food security status of rural farming households in Ogun State, Nigeria. Therefore, households with higher incomes are more likely to be food secure than households with lower incomes. This is expected as income is required to acquire adequate, hygienic, and wholesome food.

CONCLUSION AND RECOMMENDATION

The study showed that cooperative societies facilitate their members' access to productive resources like credit, production inputs, and educational training. Food insecurity existed among the cassava farming households with its incidence, depth, and severity higher among the non-cooperative farming households than the cooperative farming households. The age of the household head, household size, membership in a cooperative, and income were found to be important predictors of food security among the households. It is, therefore, concluded that being a member of a cooperative society has a positive and significant effect on the household food security status of cassava farmers in the study area. It is therefore recommended that farmers be encouraged to join existing cooperative societies. Additionally, since cooperative societies can enhance members' levels of food security, their formation should be promoted through the training of farmers. More incentives such as credit facilities should be provided to farmers for them to increase production or adopt modern techniques that will result in increased income, thereby improving food security.

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