



Food security among cashew farming households in Kogi state, Nigeria

Matthew Durojaiye Ayeni ·
Matthew Olaniyi Adewumi

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Abstract The effects of increasing the levels of cashew production on income, food security, nutrition and consumption among rural households are very complex. While its production is expected to boost rural households' income, it has tendencies of reducing land and other resources for food crop production. However, to the best of the researcher's knowledge there is not much empirical data available on its effects on households that are engaged in cashew farming in Nigeria. As a result, food security in Nigerian households engaged in cashew farming was analyzed, and the factors influencing food security were identified. Using a multi-stage sampling technique, 228 cashew farmers were carefully chosen for this study. Descriptive statistics, logit regression and food security index, were used to evaluate the primary data that was obtained through the use of a structured questionnaire. The result revealed that with an average of 2145 kcal per capita calorie intake, the majority (58.8%) of cashew farming households were food

insecure. Food security status among cashew farming households was determined by household size, farming experience, education level of households food planner, roots and tubers output, Annual off-farm income, output of cashew and output of cereals. The study recommended the need for nutrition-oriented programmes, adoption of modern family planning techniques and income diversification among cashew farming households.

Keywords Cashew · Food security · Households · Logit

Introduction

The effectiveness of cash cropping as a means of promoting food security in poor nations has been one of the key concerns that have dominated discussions of food policy (Jarzebski et al., 2020; Wiggins et al., 2015). Smallholder farmers are transitioning from producing staple food crops to cash crops all across the world, which has caused serious worries about food security (Thanichanon et al., 2018). Governments and development organizations have been working diligently for a long period of time, particularly in sub-Saharan Africa, to encourage the production of cash crops as a means of enhancing food security by raising incomes. (Jones & Gibbon, 2011). Cash crops may have an impact on food security, but

M. D. Ayeni (✉)
Department of Agricultural Economics College
of Agricultural Sciences, Landmark University, Kwara
State, PMB 1001, Omu-Aran, Nigeria
e-mail: ayeni.matthew@lmu.edu.ng; ayenimd2@gmail.com

M. O. Adewumi
Department of Agricultural Economics and Farm
Management, University of Ilorin, Kwara State, P.M.B.
1515, Ilorin, Nigeria
e-mail: matolade@unilorin.edu.ng

it is still unclear to what extent or how (Anderman et al., 2014).

Food security according to the World Bank (1986), is a state of having physical and economic accessibility to enough food required to live a healthy and active life all the time by all people. A major pressing economic and social issue in ‘Sub-Saharan Africa’ (SSA) in the twenty-first century is food insecurity (Food and Agricultural Organization (FAO), 2019). The predicted number of undernourished persons worldwide in 2019 was found to be close to 690 million (8.9% of the world’s population) and it is projected that by 2030, there will be 841.4 (9.8%) million people who will be food insecure, with 51.5% (433.2 million) of those people living in Africa, the continent with the greatest rate of under nutrition worldwide (FAO, 2020). Harsh weather conditions, conflicts, and a challenging global economic environment that wreak havoc on agricultural production has been a major determinant of food instability and malnutrition in the region.

The importance of cash crops in achieving poverty alleviation and food security in low-income nations has been a hot topic in food policy debates (Jarzebski et al., 2020). The issue of increasing rural incomes in Africa, which are now considered to be peasants with inadequate input, low-productivity farming systems, could be solved by cash crops (Oduol et al., 2013).

Engagement in cashew farming, a cash crop in Nigeria, is an important income-generating activity among households in cashew producing states of Nigeria and contributes to several of the other SDGs through enhanced livelihoods, and to gender equality through women’s cashew-related activities. Additionally, it has tremendous potential for high-value addition, improving income for many people, and serving as a significant source of added income for rural and urban residents who are involved in the primary and secondary cashew activities (Suberu et al., 2015).

Cashew production in Nigeria has gotten a fresh lease on life as a result of a worldwide boom in demand for cashew nuts and their apple (National Cashew Association of Nigeria (NCAN), 2017). Nigeria is currently one of the top ten in the world and the largest producers in Africa with a production of 958,860 Metric tons in 2019 (FAO, 2020) (Fig. 1).

Cash crop production is expected to raise household income thereby increasing households’ access to food, improve household food security, and improve

household welfare. However, views that cash crops like cashew being a non-food crop will compete with food crop production and thus increase food insecurity have hampered the promotion of cash crops as a means to improve farmers’ livelihoods, achieve rural development, poverty reduction, and food security in Africa. Especially considering that households’ access to and consumption of food is largely dependent on the set of crops they produce (Mariwah, 2013; Ojo, 2005).

Due to the high income from cash crops, farmers often cease growing food crops in favor of producing cash crops, which consumes most of their agricultural resources. In a small number of cases where food crops are grown alongside the cash crop, the negative impact of the cash crop canopy on the food crops deters farmers from doing so. The effect of this action, according to Ojo, (2005), is that there will be shortages in food production in such an area which will negatively affect the households nutritional and food security status in these areas.

Empirical research on the topic of the connection between cash crops and food security is still ambiguous, raising additional questions about the usage of arable areas for growing cash crops. This research, therefore, seeks to examine the implication of cashew cultivation on household food security.

The majority of cashew studies conducted in Nigeria, (Adeigbe et al., 2015; Olife et al., 2013; Salau et al., 2018), concentrated on production and marketing issues. However, to the best of the researcher’s knowledge there is not much empirical data available on its effects on households that are engaged in cashew farming in Nigeria. However, study in Nigeria on the subject of the “food security” of households engaged in cashew, to the researchers’ knowledge, is rare.

The first goal of the study is to describe cashew producers’ socioeconomic characteristics. The second goal is to assess the “food security” situation of the cashew farming households, and third goal is to pinpoint the factors that influence “food security” among cashew farming households in the study region.

Literature review

Food security definition

The subject of ensuring food security, particularly in developing nations, has attracted a lot of



Fig. 1 Map of Nigeria showing the study area. Source UN cartographic section: Available from <https://www.nationsonline.org/oneworld/map/nigeria-administrative-map.htm>. Accessed on 01/12/2022

attention in academic and global policy discussion (Jarzebski et al., 2020). Despite its relevance on a worldwide scale, the idea of food security is difficult to define since it is given too many different meanings (Santeramo, 2015). According to World Bank (1986), “food security is accessibility to adequate food to live a healthy active life every time by everybody. The Food and Agriculture Organisation of the United Nation (FAO) afterwards came up with another broad but generally agreed definition: “food security exists when everyone at all time can access (physically and economically) sufficient food that is safe and nutritious to meet their healthy and active” (FAO, 1996).

Changing from traditional to cash crops and their effects on food security

Numerous studies have established both the detrimental effects of commercializing agriculture as well as the direct link between agriculture and the food security of farm households. But there isn't a consensus on what this influence looks like in terms of how it affects household food security (Anderman et al., 2014). There are conflicting results about how this shift affects food consumption and nutrition; some studies have shown that it has devastating impacts, while other research has indicated that it has a neutral or favorable impact. According to those

opposed to this change, the issue of malnutrition could be lessened in many nations if the resources currently utilized to grow agricultural export crops were switched to the production of food for domestic use. Conversely, proponents assert that commercialization might increase agricultural incomes and enhance nutrition through the benefits of comparative advantage.

Strasberg (1997) finds that in Northern Mozambique, involvement of farmers in cotton outgrower schemes was the main way to obtain cash inputs for use in food production during a period of credit and input market failures.

There are numerous ways that cash crop production could improve farmer livelihoods and food security, according to Timmer (1997) and Jayne et al., (2014). First, by producing a crop with a better return on their productive resources through specialization in cash crop production, farm households can enhance their overall income; They can then reach a greater degree of welfare, including food security, by using the revenues from cash crops to buy both food and non-food items.

Poulton et al., (2010) also argued in favour of cash crop that the introduction of cash cropping opportunities means that households are less cash constrained to purchase improved inputs for their food crops. The cash income, according to him, ultimately offers opportunities for farmers to invest and improve the management of their farms, thus stimulating agricultural innovation and increasing the yields.

Studies by Govereh and Jayne (2003), and Sahn (1990) in Zimbabwe, and Cote d'Ivoire, respectively, found that farmers growing cash crops regularly earn higher incomes than peer groups growing food crops.

Hashmiu et al., (2022) Findings in Ghana indicate positive relationships between the revival of cocoa farming, household crop income and food security, due to complementarities between cocoa, food crop and cashew production.

Patnaik (1996) argued that the unstated goal of cash crop shifting policies appears to be to limit domestic income growth and the consumption of developed country products by populations in developing countries in order to free up resources for the expansion of exportable goods that are in demand in the developed world.

Anderman et al., (2014) in their study of oil palm and cocoa farmers in Ghana's MVP Bonsaaso Cluster,

that there exist a negative relationship between food security of the farmers households, and their engagement in cash crops.

According to Behera et al., (2016), the change in India from the traditional crop "jhum" to a cash crop exposed farmers and consumers to market volatility, which has effects on both the long-term and short-term food security. Additionally, it was shown that dietary diversity was greater under jhum than under any other cash-crop system and greater under traditional cash-cropping than under modern cash-cropping.

Food security determinants

According to the empirical literature, socioeconomic factors in addition to income are anticipated to have an impact on the food security of farming households. The size of the household is thought to have a detrimental effect on food security (Alpizar et al., 2020; Babatunde et al., 2007). It is anticipated that the household head's age will have a favorable impact on the availability of food (Agidew et al., 2018; Zhou et al., 2019), same with the education level of the households (Assefa, 2020; Mango et al., 2018; Nkomoki et al., 2019). Farming experience (Agidew et al., 2018; Oluyole et al., 2009), off farm income (Etea et al., 2019; Rhebergen et al., 2016), gender being female (Anderman et al., 2014; Felker-Kantor et al., 2012), food planner education level (Amaza et al., 2006; Omotesho et al., 2010), are all expected to have positive influence on households food security.

Methodology

Study area

This research was conducted in Kogi State, Nigeria's north-central zone: With an estimated 4.5 million residents as of 2016, Kogi is the 20th most populated and thirteenth largest in terms of area out of Nigeria's 36 states. According to the 2006 census, there are 3,278,487 people living in the state and majorly agrarians; 1,691,737 of whom are male and 1,586,750 are women (National Population Commission, 2006).

Geographically, the state is a part of the mosaic Eco region of tropical Guinean forests and savannas.

The major rivers, the Niger coming from the north-west and the Benue from the northeast, before they meet in the middle of Kogi and divide the state in half from north to south, are significant geographical features. (Abiodun, 1985). Kogi State's economy is mostly focused on agriculture, particularly the production of cashew, yam, coffee, groundnut, cocoa, and oil palm. The extraction of crude oil and the management of sheep, goats, and other livestock are two other important enterprises. The state's climate averages between 1100 and 1300 mm of rainfall each year. Every year, the dry season lasts from November to March, whereas the rainy season lasts from April to October. (Jimoh, 2022).

Sampling procedure

In this study, multistage sampling technique was used to select the respondents. In the first stage, three Agricultural Development Zones known with cashew production among the four zones in the state were selected purposively; the selected zones were A, C and D. Second stage involved two communities selected randomly from each of the three zones. The last stage involved 40 cashew farmers selected randomly from each of the six communities making a total of 240 farmers. However only 228 questionnaires were actually used because 12 questionnaires could not be recovered and had inaccuracies.

Data collection

228 households from 6 localities made up the representative sample, which had a 95% confidence level and a 7% accuracy rate. Prior to being surveyed, all research participants were asked for their informed consent. A semi-structured questionnaire and an interview schedule-guide were used to collect the data. A schedule for interviews was also developed to help get the necessary data from the rural farming homes. To facilitate connection with the rural farmers, the data were gathered by researchers and research assistants who are fluent in the regional tongues.

Data analysis

Descriptive analysis, individual dietary intake, and regression (Logit) were used to analyze the data. Descriptive statistics was used to describe the

socioeconomic features of the farming households. This includes the use of frequency, percentage, and mean.

Individual's dietary intake

The study created a food security index (Z_d) and assessed each cashew farming "household's food security" status based on the requisite calorie consumption so that the "food security" of farming households in the study area can be ascertained. Households whose daily calorie were equal or exceeded the daily calorie recommended were considered food secured while those households with daily calorie intake lower than the daily calorie recommended were classified food insecure households.

"Food security index" construction

The "food security index" was calculated thus:

$$Z_d = \frac{Y_d}{R} \quad (1)$$

where Z_d denotes "food security index" of ith household, Y_d is "Real Daily Calorie Intake of ith households" and R is the Endorsed "Daily Calorie Requirement of ith household".

Per capita daily calorie intake

Data on 105 different food products were collected on household food intake. Food from one's own production, purchases from markets, and out-of-home meals and snacks all count toward consumption. Using a 7-day recall, the local food composition table was used to translate the household level food consumption into calories (Babatunde et al., 2007). The obtained calorie values were divided by the total number of Adult Equivalents (AE) in a family to determine the per-person calorie consumption (Babatunde et al., 2007). This amount was once more divided by the seven-day recall interval to get each household's "per capita daily calorie intake". The minimal daily calorie need per adult equivalent is 2500 kcal, and we define a food secure family as one whose daily calorie consumption per AE is greater than or equal to that amount (FAO/WHO/UNU, 1985). Low-calorie households are regarded as being undernourished.

Food insecurity gap

The “food Insecurity gap” was estimated using

$$= \frac{1}{M} \sum_{j=1}^n G_d \quad (2)$$

where: M=insecure households. G_d =“calorie intake deficiency” for the i th households.

$$G_d = \frac{Y_d - R}{R} \quad (3)$$

where Y and R, are as defined in Eq. 1.

The headcount ratio (HCR)

The “headcount Ratio” is specified below as:

$$\frac{M}{N} \times 100\% \quad (4)$$

where N=Total number of households in the sample.

The surplus index (SI)

The surplus Index is:

$$= \frac{1}{M} \sum_{j=1}^n \frac{R - Y_d}{R} \quad (5)$$

Daily household calorie needs

In calculating the daily Calorie needs, each family member was grouped by age because of the different calorie requirement by each age. The daily energy (calorie) requirements of the various configurations of households were converted to equivalents of adults using the scale (Table 1).

Calories surplus/shortfall

The “calories surplus/shortfall” was calculated as shown below:

$$P = \frac{1}{N} \sum_{j=1}^m G_j \quad (6)$$

G_j is stated as:

$$(X_d - S) - S \quad (7)$$

where P is the “Surplus/Shortfall”, S is the required “daily per capita requirement” (2500 kcal); G_j “Calorie faced by household”, X_i “Per capita food consumption available to household” and N is the “number of households that are food secure (for surplus index) or food insecure (for shortfall index)”. Table 2.

Total household composition or calorie requirement

2500 kcal as recommended by (FAO/WHO/UNU, 1985) was used to multiply each household adult composition to obtain their calorie requirement.

For children, adult equivalent conversion was used. This was changed by multiplying a conversion factor of 0.4 by 2500 kcal, the recommended daily calorie requirement for the total number of children under 6 in each household. Additionally, the number of children aged 6 to 18 in each household was multiplied by a conversion factor of 0.7 by the recommended daily calorie requirement of 2500 kcal to obtain the same number of calories as adults. The three age groups estimated were summed up to obtain each household total needed calorie.

Households’ daily food consumption (Daily calorie intake)

Weekly consumption by each household was converted to kilogram using energy content of each food-stuff (1 kg) as obtained from the literature.

Logit model estimation for determinants of cashew farming household’s “food security status”

Factors determining food security of farming households were estimated with the Logit model using the household food security index (Z). Because a logistic regression analysis uses multiple regression analysis approaches to models where the outcome variable is categorical, as it does with the outcome variable in this model, the binary logit was used. The model assumes that the outcome variable, Z_i is categorical (e.g. dichotomous) and it takes the value 1 for the food secure household and 0 for the food insecure household (Awotide, et al., 2011). The variables that were considered as determinants of household food security status were chosen using various literatures as guide. These include: Omotesho et al., (2010), Agboola (2014).

Table 1 Food composition table. *Source* Babatunde and et al., (2007)

Food items	Kcal/Kg	Food items	Kcal/Kg
<i>“Staple foods”</i>		Mango	590
“Cassava tuber”	1500	Pawpaw	300
“Cassava flour”	3870	Pineapple	320
“Cassava chips”	3000	Apple	570
“Garri”	3840	Coconut	580
“Yam tuber”	1100	Guava	730
“Yam flour”	3810	Sugarcane	360
“Yam ships”	3000	<i>Meat and animal products</i>	
“Sweet potato tuber”	1100	“Cow meat”	2370
“Sweet potato chips”	900	“Goat meat”	2370
“Irish potato”	1200	“Sheep meat”	2370
“Cocoyam tuber”	3830	“Pork	2370
“Maize green”	3100	Bush meat	2370
“Maize grain”	4120	Chicken	2380
“Maize flour”	4120	Turkey	2380
“Sorghum grain”	3500	Fish	2230
“Sorghum flour”	3500	Snail	2245
“Millet grain”	3500	Shrimps	2230
“Millet flour”	3500	Crayfish	2200
“Rice”	1230	Crabs	2200
“Wheat grain”	3400	Eggs (pieces)	1400
“Wheat flour”	3300	<i>Vegetables</i>	
“Cowpea (beans)”	5920	Okra	4550
“Ground nut”	5950	Tomato	880
“Soybeans”	4050	Pepper	3930
“Soybean flour”	2600	Onion	440
“Melon (shelled)”	5670	Carrot	400
“Plantain”	770	Egg plant	440
“Banana”	960	Cucumber	270
<i>Dairy products</i>		Cochorus/ewedu	500
“Milk”	4900	Spinach	220
“Cheese”	4000	Bitter leaf	220
“Yoghurt”	4100	Water leaf	180
“Ice cream”	4100	Cabbage	230
<i>Beverages</i>		Pumpkin	440
“Cocoa”	1200	<i>Drinks</i>	
“Tea (leaves)”	1200	Soft drinks	620
“Tea (liquid)”	1200	Orange juice	400
“Coffee (powder)”	1340	Apple juice	550
“Coffee (liquid)”	1340	Pineapple juice	560
<i>Condiments and spices</i>		Local beer	740
“Maggi”	220	Bottled beer	460
“Salt”	180	Wine	330

Table 2 Recommended daily calorie consumed intake and equivalent scale. *Source* FAO (2005)

Age category (years)	Scale
Children (below age 6)	0.4
Children (between age 6–18)	0.7
Adult (above age 18)	1.0

$$Z_d = E\left(Y_i = \frac{1}{X_i}\right) = e(\beta_0 + \beta_1 X_1 + \beta_2 X_2 \dots \beta_i X_i) + U_d \quad (8)$$

Z_d = food security status of the household (1= food secure, 0= otherwise), β_0 = the intercept which is constant, β_1 =the “coefficient of determinants of food security” in the study area, X_i =set of independent factors/variables. ($i = 1 - 11$), U_d =the error term.

The independent factors/variables that were hypothesized in the model include: Educational level of household food planner, adjusted household size, households annual off farm income, annual output of food crops (cereals, root and tubers), membership of cooperative society, cashew annual output, household head marital state, nature of households indicating monogamous or polygamous category of the household, gender, distance of household residence to the nearest food market and annual consumption credit accessed by the households.

Results and discussion

Socio economic features of the rural farmers

Socio-economic characteristics of the cashew farmers is presented in Table 3. It reveals that 17.5% of the total respondents are of age 40 years and below indicating that the proportion of youths among cashew farmers is low. Meanwhile, 72.4% of the total cashew farmers are of age 60 years and below an indication that 72.4% of the farmers are still within the productive age of 60 years and below. Given the ageing nature of the sample, the effective labour force for cashew farming productivity in the study area may tend to reduce.

The Majority of the households were married and they constituted 92.8%. This suggests that farming is a means of catering for the family in the study area.

The result of farming households' gender reveals that the respondents are majorly male (93%) while female are 7%. This is an indication that both males and females are into cashew farming activity in the study area. The higher proportion of men however implies that more males are involved in cashew farming than females in the study area. This outcome is consistent with the cultural environment in Africa, where men have easier access to farms and other agricultural inputs. Gender has an effect on how resources, money, labour, political power, and the enjoyment of rights and privileges are distributed in the household and society, as well as how people make decisions and exercise their rights (Welch et al., 2000).

Food security status of the households

Table 4 presents the summary statistics of food security indices of the respondents in the study area.

It was observed that 41.2% of the households were food secure as shown by the result and 58.8% were food insecure using the “2500 kcal daily calorie recommendation”. The average per capita calorie intake in the area was 2145 kcal. Compared to the national average, this was lower. Food-secure cashew farming households consumed 3292 kcal per person on average, which was more than the national average. The calorie 1283 kcal intake for the food insecure, was lower than the average for the nation. Having only 41.2% of the cashew farming households meeting the recommended calorie requirement of 2500 kcal, the households could be classified as food insecure. Table 5.

The food insecure households had a shortage of 43% to meet up with the recommended calorie intake, while the food secure households exceeded the calorie requirements by 50%.

Distribution of food security status by socio-economic variables of the respondents

The distribution of food security status by household's size as shown in Table 6, reveals that all households with a household size of more than ten were food insecure, whereas 14.9 percent were food secure in households of size 5.1–10. The household with the largest percentage (61.1%) of food-secure members is a family with ≤ 5 size.

Table 3 Description of variables in the logit models to estimate food security determinants. *Source* Author concept

Xi	Variable	Definition	Measurement	Apriori expectation
X1	hhfpeduc	Educational level of household food planner	ordinal variable	(+)Better educated household's food planner are more likely to make good decisions concerning the households' nutrition
X2	hhsize	Adjusted household size	Adult equivalent	(−) More food is required when there are more occupants in a house. A large family will probably spend more money on food and be more vulnerable to hunger
X3	hhoffincome	Households annual off farm income	Naira	(+)It is projected that off-farm income will lead to an increase in resource availability. This is expected positively affect households access to food
X4	foodcrops	Annual Output of food crops (cereals, root and tubers)	Grain equivalent	(+)Production of roots and tubers is anticipated to provide access to owned food for consumption in families as well as increase food availability. A household that grows more roots and tubers is more likely to have access to food
X5	hhdgrp memb	Membership of agricultural cooperative society	Dummy (1 = Member of group)	(+) This variable is a proxy for farmers' social capital and provides opportunity for human capital and information sharing which are likely to promote informed nutrition decisions
X6	cashewoutp	Annual output of cashew	Kg	(+)Cashew production is expected to raise household income. Households with higher cashew production are also expected to have access to enough food
X7	hhmstat	Marital status of the household head	Dummy (1 = Married and living with spouse)	(+) Married household heads living with their spouse(s) are more likely to be food secure
X8	hhdnature	Nature of households indicating monogamous or polygamous category of the household	Dummy (1 = Monogamous household)	(+) Monogamous households are expected to have better welfare levels due to reduced competition for family resources and are likely to be more food secure
X9	hhgender	Gender of household head	Dummy (1 = Male)	(±)In addition to being frequently in charge of processing and cooking food for their households, women normally have a greater role in assuring nutrition and food safety for their family and more of their income are devoted to household food purchases. A home headed by a woman is likely to have better access to food, but they might not have the funds to buy it
X10	mktdist	Distance of household residence to the nearest food market	Km	(−) Nearness of household residence to food markets increases market information and access to available food required to be food secure

Table 3 (continued)

Xi	Variable	Definition	Measurement	Apriori expectation
X11	conscredit	Annual consumption credit accessed by the household	Naira	(+) Consumption credit increases household income in the short run. A higher consumption credit accessed households will likely be more food secure than a household without access

Table 4 Rural farmer distribution based on socioeconomic factors. *Source* Computed from field survey

Characteristics	Category	Frequency (n = 228)	Percentage	Mean	Standard deviation
Gender of household head	Male	212	83.00		
	Female	16	17.00		
Household head marital status	Single	6	2.60		
	Married	208	91.20		
	Divorced	2	0.9		
	Widow(er)	8	3.50		
	Separated	4	1.80		
Household head age	≤ 30	14	6.10	54	11
	31–40	26	11.40		
	41–50	35	15.40		
	51–60	90	39.50		
	> 60	63	27.60		
Household size (AE)	≤ 5	131	57.50	5	2
	6–10	94	41.20		
	> 10	3	1.30		
Household head educational status	No formal education	60	26.32		
	Primary education	61	26.75		
	Secondary education	92	40.35		
	Tertiary education	15	6.58		
Rural farming experience (years)	≤ 10	115	50.43	12	4.3
	11–20	96	42.11		
	> 20	17	7.46		
Rural farm size (ha)	< 1.00	25	10.96		
	1.00–5.00	127	55.70		
	5.1–10.00	56	24.56		
	> 10.00	20	8.77		
Primary occupation of rural household head	Farming	182	79.8	5	3.5
	Non-farming	46	20.2		
Cooperative membership status	Member	144	63.2		
	Non-member	84	36.8		

The table also reveals that a higher percentage of household members of homes with food planners having a postsecondary degree are food secure. While

households with food planners with no formal education have 7% of the total household members that are food secure. This means that the food planner's

Table 5 Summary statistics and food security indices for the entire households. *Source* field survey

Food security indices	Food secure household	Food insecure households	All
Percentage of household	41.2	58.8	100
Number of households	94	134	228
Food Security Index (Z)			
Mean	1.5	0.57	0.9
Standard deviation	0.15	0.13	0.48
Per capita daily calorie availability	3.292	1.283	2.145
Food insecurity gap/surplus Index (p)	0.5	0.43	
Head count ratio (H)	0.41	0.59	

Table 6 Distribution of food security status by socio-economic variables of the respondents. *Source* Field Survey

Socio-economic variables	Food secure households	Total households	Percentage of food secure household
<i>Household size (AE)</i>			
≤ 5	80	131	61.1
5.1 – 10	14	94	14.9
> 10	0	3	0.0
<i>Household food planner education level</i>			
No formal education	3	43	7.0
Primary	14	78	17.9
Secondary	65	92	70.7
Tertiary	12	15	80.0
<i>Gender</i>			
Male	85	212	40.1
Female	9	16	56.3
<i>Marital status</i>			
Single	5	6	83.3
Married	77	208	37.0
Widow(er)	4	6	66.7
Separated	4	4	100.0
Divorced	4	4	100.0
<i>Household head age range</i>			
≤ 30	4	14	28.57
31–40	6	26	23.08
41–50	3	35	8.57
51–60	54	90	60.00
> 60	27	63	42.86

education is critical to food security. An educated food planner is anticipated to be well-informed and capable of making sound nutritional judgments that would improve the household's food security.

It can also be seen from the table that the distribution of food security status by gender of household heads, reveals that greater percentage (56.3%)

of the total members of a female-headed household are food secure, while a male-headed household had 40.1 percent of the total household members food secure. The implication of this result is that gender of the household head plays an important role in ensuring food security.

Also, the classification of food security status by household head marital status from the table demonstrates that homes with separated or divorced heads had 100 per cent of their household member's food secure. Household heads who are married account for the smallest percentage (37%) of secure household members. This is most likely due to insufficient finances that must be divided among many expenses, such as baby care, school tuition, clothing, and so on.

Further result shown in the table is the household food security distribution by the age of the household head in Table 6. It reveals that 60% of the total household members whose household head is within the age 51–60 years are food secure, while 8.6% of the total household members of a household head within age range 41–50 are food secure. This is probably due to the fact that age range 41–50 are in their active children production age, greater percentages of the households expenses at this stage will be on children education which will affect the availability of resources for food. Also, the age range 51–60 are probably well informed of the importance of diet and good food.

The distribution of per capita calorie intake by household head age is shown in Table 7. It shows that the age group 51–60 had the greatest per capita daily calorie consumption (2608), which is likely due to various food health awareness campaigns for persons in this age group. The age group 41–50 had the lowest per capita calorie consumption of all the age groups, with 1961 cal consumed per person. People in this age group are more concerned with generating cash to support their families and may trivialize the quality of the food they consume.

Table 7 Distribution of per capita calorie consumption by age of household head. *Source* Field Survey

AGE	Per capita daily calorie consumption per adult equivalent
≤ 30	2252
31–40	2297
41–50	1961
51–60	2608
> 60	2177

Determinants of food security status of cashew farming households

The model predicted the food security status of cashew farming households with 85.3 percent accuracy, according to the results of the logit regression provided in Table 8 in terms of predictive efficacy. The results also demonstrate that in understanding the factors responsible for cashew farming households' food security status, the model was adequate. Three of the eleven factors in the model (Household size, Nature of household head home, Education status of the food planner for the household) were found to be significant at the 1% level and three other variables (output of food crops, annual off-farm income of the household and annual output of cashew) were significant at 5% level in explaining the variation in the food security status of cashew farming households in the research area.

Household size

This variable has a negative coefficient and is significant ($t = -4.07$, $p0.01$). As a result, the level of food security in the household would decline as the size of the household increased. A unit increase in the size of the household will result in a 0.08 reduction in the likelihood that households will be food secure. This outcome was anticipated because more homes means more people are consuming the same resources. Larger households experience food insecurity more frequently than smaller ones (Babatunde et al., 2007; Oluyole et al., 2009).

Nature of household family

Polygamy or monogamy in the household family has a positive coefficient ($t = 1.09$, $p 0.01$) that is significant at the 5% level. A monogamous family has greater access to food than a polygamous household. This outcome is anticipated since monogamous households should have greater food security due to less rivalry for scarce family resources.

Education status of the food planner

The educational level of the food planner revealed a significant positive correlation ($t = 3.45$, $p 0.01$). Food security is more likely in households with

Table 8 Estimates of logistic regression of determinants of food security status of cashew farming households. *Source* Field survey

Variables	Coefficient	Standard error	t-value	Marginal effect
Household size	− 2.54***	0.62	− 4.07	− 0.08
Nature of household home(polygamous, monogamous)	1.09***	0.26	4.26	0.03
Education status of food planner	0.42***	0.12	3.45	0.01
Gender of household head	0.52	2.43	0.21	0.02
Cashew annual output	3.70**	1.55	2.38	0.12
Distance of household residence to the nearest market	− 0.40	0.24	− 1.64	− 0.01
Output of food crops	2.64**	1.17	2.25	0.08
Annual off farm income	1.34**	0.52	2.56	0.04
Household head marital status	0.00	0.00	1.91	0.00
Association membership	0.51	0.84	0.61	0.02
Consumption credit accessed by the household	1.64	1.16	1.42	0.05
Constant	− 16.58**	7.49	− 2.21	
LR Chi2	268.19			
Prob > Chi2	0.00			
Pseudo R2	0.85			
Log likelihood value	− 23.06			
Number of observation	228			

Dependent variable: Food security status. “*significant at 10% level, **significant at 5% level, ***significant at 1%level”

knowledgeable food planners than in those without. The results show that a family food planner year increase in education enhances the likelihood of a home being food secure by 0.013, on average. Because education is a type of social capital and food security is anticipated to be positively influenced by this variable. This study’s findings are in line with previous findings (Amaza, et al., 2006; Omotesho et al., 2010).

Cashew annual output

A unit increase in cashew production increases the likelihood that a household will have access to enough food by 0.1153. ($t=2.38$, p 0.05) The variable is significant and has a positive coefficient. Due to the cashew crop’s ability to increase household income, there is more money available for household spending. This result is consistent with Oluyole et al., (2009) findings.

Output of food crops

This variable was significant ($t=2.25$, p 0.05) and had a positive coefficient. Increases in root and tuber output in a home are likely to be associated with the

availability of more food for such households. According to the marginal effect, a unit increase in root and tuber output raises the likelihood of households being food secure by 0.0822. This finding is consistent with the findings of Oluyole et al., (2009), who found that root and tuber production had a favorable impact on food security in households.

Annual off-farm income

This variable was significant and positive ($t=2.56$, p 0.05). A 0.0417 increase in household income enhances the likelihood of a household being food secure. This means that the higher the household’s income, the more likely it is that the family will be food secure. This is to be expected because, other things being equal, an increase in income means more food access. This result agrees with the findings of Babatunde et al., (2007), Arene and Anyaeji (2010), Etea et al., (2019).

Conclusion and policy recommendations

The cashew farming households in Nigeria were the subject of this study. The study evaluated their level

of food security, including its underlying causes. The study's findings indicate that SDG 2 of eradicating hunger is under threat because most cashew farming households were not food secure.

The negative driving factor which contributed to high food insecurity among cashew farming households was household size; while food planner level of education, off farm income, cashew output and output of food crops were the factors reducing the food insecurity level among cashew farming households.

To achieve the SDG of hunger eradication, the study recommends the following:

1. Strategies that will alleviate Food security should be focused on the determinants identified in this study and other factors that are related to achieving household food security.
2. It is important to encourage rural farming households to maintain household sizes that are compatible with their incomes. This can be accomplished by implementing family planning and birth control education initiatives.
3. Cashew farmers should be encouraged not to abandon food crops farming but make it an addition to the cashew farming.
4. It is important to support initiatives that could boost household income creation.

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Data availability Raw data will be available upon request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Ethical approval included.

Consent to participate Not applicable.

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