



SOCIO-ECONOMIC ATTRIBUTES AND FOOD INSECURITY COPING STRATEGIES NEXUS AMONG SMALL HOLDER CROP FARMERS IN KADUNA STATE, NIGERIA



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Abstract: The study established the relationship between socio-economic attributes and food insecurity coping strategies adopted by crop farmers. Specifically, the study described socioeconomic characteristics of the household; establish the food security status of farming households in the study area; describe food insecurity coping strategies adopted by the farmers and determine the link between socioeconomic attributes and food insecurity coping strategies adopted by the farmers. A multistage sampling technique was employed in selecting 240 crop farmers from the 4 ADP Operational Zones of the state. Questionnaire was used to elicit data from farmers. The data were analysed using descriptive statistics, food security model and multinomial logit model. The study showed that about 80% of the farmers had formal education. About 61% of the farmers were food secure, while 39% were not. Limiting size of food consumed, changing crop varieties, engagement in non-farm activities, were among the food insecurity coping strategies of farmers. Age of farmers, years of education, extension visits and years spent in cooperatives had significant relationship with food insecurity coping strategies. It was therefore recommended that the number of ADP extension staff should be increased so that extension staff visit to farmers could be at least three times a year, in order to provide effective extension visits to farmers so as to give advice on different ways to cope with food insecurity in the state. Government should provide incentives to farmers such as price ceilings and price floors and also buy surpluses from farmers, this will motivate farmers to produce more than enough that will take care food insecurity in the State.

Keywords: Coping strategies, food security, Kaduna State, socioeconomic attributes

Introduction

Various interventions have been made by governments of various countries in West African like Nigeria to modernize agriculture which was previously characterized by sluggish growth, low factor productivity, declining terms of trade, and often linked to practices that degrade the environment (Salama *et al.*, 2010). Nigeria is an agrarian country with about 70 percent of the population engaged in agriculture production (Ugwu and Kanu, 2011). Despite the rapidly growing oil industry in Nigeria, agriculture still accounts for over 40 percent of the GDP. The major agricultural commodities, by production quantity, are (in this order) cassava, yams, maize, sorghum, vegetables, rice, citrus fruit, groundnuts, and sweet potatoes (FAO, 2011). Agricultural productivity is showing signs of recovery, after decades of decline, but it is happening too slowly to meet the demands of a rapidly growing urban population (IFPRI, 2011).

The World Food Summit of 1996 defines food security as “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life” (World Food Summit, 1996). The three dimensions of food security are food availability, food accessibility, and food utilization. At the household level, food security implies sufficient access to food over time, and is not affected by any shocks or risks affecting food production (Akinyele, 2009). Food is the basic need and necessity of life that must be satisfied before any other developmental issue. Inadequate nutrition is considered as measure of poverty and food insecurity in many societies (Datt *et al.*, 2000). According to Helen (2002) food security maintains political stability, and ensures peaceful coexistence among people, while food insecurity results in poor health and reduced performance of both children and adult. Malnutrition refers to all deviations from adequate nutrition, including undernutrition and over nutrition relative to need (Shetty, 2003). Malnutrition arises from deficiencies of specific nutrients or from diets based on wrong types or proportions of food. Under-nutrition is the outcome of insufficient food caused primarily by an inadequate intake of dietary or food energy, whether or not any specific nutrient deficiency is present. Under-nutrition is defined as dietary energy intake

below the minimum requirement level needed to maintain the balance between actual energy intake and acceptable levels of energy expenditure (Shetty, 2003).

Food insecurity has profound implications for health and welfare of the rural society. Eradication of hunger and food insecurity remains key developmental challenges in Nigeria (Reichwage, 2010). Understanding food security in Kaduna State, the insecurity coping strategies as well as the link between socioeconomic attributes and food insecurity coping strategies adopted by farmers is crucial to designing sustainable strategies to reduce hunger, food insecurity and malnutrition in Nigeria. The objectives of this study include describing socioeconomic characteristics of the household; establish the food security status of farming households in the study area; describe food insecurity coping strategies adopted by the farmers and to determine the link between socioeconomic attributes and food insecurity coping strategies adopted by the farmers.

Materials and Methods

Study area

This study was conducted in Kaduna State. Kaduna State is located in the Guinea Savannah ecological region of Nigeria. Kaduna State lies between latitudes $09^{\circ} 02^{\prime}$ and $11^{\circ} 32^{\prime}$ North and longitudes $6^{\circ} 15^{\prime}$ and 09° East of the meridian. The state has a total land area of about 4.5 million hectares (approximately 48,473.2 km²). It has a population of 6,066,512 people, out of which 75% are engaged in agricultural production as a means of livelihood and employment (Laah, 2003). It has an annual rainfall of between 1500 mm and 2000 mm. The rainy season commences in April in the south, but it is as late as June in the north. The dry season extends from October to May. The state consists of twenty three Local Government Areas. The cropping system of the state involves both mixed cropping and sole cropping of a wide variety of crops such as maize, rice, sorghum, cassava, cowpea, soybeans, ginger, cotton, ground nut and vegetables. The state also has a good grazing land for rearing cattle, sheep, goat and poultry. Moreover,

there are dams, streams and rivers for fish culture and irrigation.

Multistage sampling was employed in this study. The first stage involved the purposive selection of one Local Government from each of the four Agricultural Development Programme (KADP) Operational Zones of the State (Maigana, BirninGwari, SamaruKataf and Lere). The purposive selection was based on their level of involvement in crop production in the study area. The Local Government Areas selected from the operational zones are SabonGari, Kajuru, Igabi and Kachia, respectively. In the second stage, two villages were selected from each LGA, giving a total of eight villages. In the third stage, thirty crop farmers were randomly selected from each village. In all, a total of two hundred and forty (240) farmers were sampled for the study.

Primary data were collected using structured questionnaire. The questionnaire was designed to elicit both qualitative and quantitative data from the farmers based on 2015 cropping season. Information collected include socio-economic characteristics of the farmers such as age, level of education, farm size, years of farming experience, household size, membership of cooperatives and number of extension visits in relation to food security coping strategies adopted by farmers. Data were analysed using descriptive statistics food security model and multinomial logit regression model to achieve the objectives of this study.

Descriptive Statistics: This was used to summarise and describe the socio-economic attributes of farmers. It was used to describe socioeconomic attributes of the farmers and food insecurity coping strategies adopted by farmers

Food security model: This is used to determine the food security status of farmers. The food security models used were:

Food security line: It was used to classify farmers into either food secure or insecure, depending on which side of the line they fall. The food security line used is the recommended daily per capita calorie intake of 2260 kilo calorie (FAO, 2005). A farmer that has up to 2260 kilo calorie food intake or more was regarded as food secure while those below were regarded as food insecure. The food security line is given as:

$$Z_i = \frac{Y_i}{R} \dots\dots\dots(1)$$

Where: Z is food security status of ith farmer, Y_i is daily per calorie food intake of ith farmer; R is recommended daily per capita calorie intake of 2260 kilo calorie.

Z_i = 1 for Y_i greater than or equal to R
 Z_i = 0 for Y_i less than R

In addition, the Shortfall/Surplus Index and the Head Count Ratio of food security were calculated for the sampled households based on food security line. The Shortfall Index (P) measures the extent to which poor households are food insecure while the Head Count Ratio (H) measures the percentage of the population of households that are food insecure/secure.

$$\text{Shortfall Index (P)} = \frac{1}{M} \left(\sum_{i=1}^M G_i \right) = \frac{1}{M} \left(\sum_{i=1}^M \frac{Y_i - R}{R} \right) \dots\dots (2)$$

$$\text{Head Count Ratio (H)} = \frac{M}{N} \dots\dots\dots(3)$$

Where M is the number of food insecure households, N is the number of households in the sample, G_i is the per capita calorie intake deficiency for ith household.

A one month (30 days) recall method was used. The household calorie intake was obtained through the household consumption and expenditure data. The quantities of every food item consumed by the households in the 30 days period were estimated. The quantities were converted to gram and the calorie content estimated using the nutrient composition table of commonly eaten foods in Nigeria (Okuneye, 2001).

Per capita calorie intake was calculated after adjusting for adult equivalent using the conversion factors for age and sex categories.

Multinomial Logit Regression Model: The multinomial logit model (MNL) is important for analyzing farmer adaptation decisions. It was used to determine socioeconomic factors influencing the choice of coping strategies adopted by the farmers. This approach is also appropriate for evaluating alternative combinations of adaptation decisions (Okoruwa *et al.*, 2009). The multinomial logit model is represented as:

$$P_{ij} = \frac{\exp(Y_j X_j)}{1 + \sum_{j=1}^4 \exp(Y_j X_j)} \text{ For } j = 1, 2, 3, 4 \dots\dots\dots (4)$$

Where P_{ij} is the probability of adopting 1, 2, 3, and 4 coping strategies
 exp = Exponent

$$P_{i0} = \frac{1}{1 + \sum_{j=1}^4 \exp(Y_j X_j)} \text{ For } j = 0 \dots\dots\dots (5)$$

Where: P_{i0} is the probability of not adopting any coping strategy (reference group)

Practically, when estimating the model, the coefficients of the reference group are normalized to zero because the probability of all the choices must be equal to unity (Okoruwa *et al.*, 2009).

Therefore, the natural logarithms of the odd ratio of equations (1) and (2) give the estimating equation as:

$$\ln = \frac{[P_{ij}]}{[P_{i0}]} = \gamma_j X_i \dots\dots\dots(6)$$

This denotes the relative probability of each group of adopting 1, 2, 3, and 4 coping strategies, to the probability of the reference group (Not adopting any coping strategy).

γ_j is the estimated coefficients of the explanatory variables.

The estimated coefficients for each choice reflect the effect of the X_i's on the likelihood of the farmers' choosing that particular alternative relative to not adopting any coping strategy (reference group).

In a simple language, the explicit form of the equation is specified as:

$$Z_i = \gamma_0 + \gamma_1 X_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \gamma_5 X_5 + \gamma_6 X_6 + \gamma_7 X_7 + \epsilon \dots\dots\dots(7)$$

Where;

Z_i is the number of coping strategies adopted by farmer i, the Z_i is defined as:

- 0 if farmer i did not adopt any coping strategy
- 1 if farmer i adopted 1 coping strategies
- 2 if farmer i adopted 2 coping strategies
- 3 if farmer i adopted 3 coping strategies and
- 4 if farmer i adopted 4 coping strategies.

The explanatory (socioeconomic) variables are as defined below:

- X₁ = Age of the respondents (Years)
- X₂ = Years of education (Years)
- X₃ = Household size (Numbers)
- X₄ = Amount of credits received (₦)
- X₅ = Number of extension visits (Numbers)
- X₆ = Years of experience in farming (Years)
- X₇ = Membership of cooperative(s) (Years spent in the cooperative)

γ₀ = Constant term

$\gamma_1 - \gamma_7$ = Regression coefficients of $X_1 - X_7$, respectively
 ε = Random disturbance term

Results and Discussion

Socio-economic attributes of farmers

The socioeconomic attributes of the respondents are presented in Table 1. The study revealed that about 81% of the respondents were within the ages of between 21 and 50 years, indicating that youths and matured adults are actively involved in agricultural activities. According to Babatunde *et al.* (2007) age of household head is expected to impact on his or her labour output and therefore his food security. Also, about 80% of the respondents had formal education while about 20% had Quranic and adult education. This implies that most of the respondents would be able to comprehend extension guides and understand written messages on innovation. This finding agrees with Yusuf *et al.* (2007) who opined that educated individuals have capacity to process and apply the information passed on to them. The household size of the respondents ranged from 4 to 20. The average household size was 9 persons per household. A large household size may reduce the cost of production for the farmer if the entire household actively participate in production activities of the farmer.

On the other hand, a large household size may increase cost of production if they are not actively participating in production activities. About 82% of the respondents received between ₦20,000 and ₦60,000 as credit to support their farming activities while about 11% of the respondents had no access to credit. About 22% of the respondent had no extension visits while, 88% received extension visits once, twice or thrice a year. Frequent extension visits educate the farmer on the new technology adopted and enhance improvement on the technology. The years of experience of the farmers ranged from 2 to 35 years with a mean of 16 years. About 46% of the respondents did not belong to any cooperative association while about 54% had spent between 1 and 30 years in cooperative association.

Food security status of the respondents

The distribution of households according to their food security status is presented in Table 2. Based on recommended daily calorie intake of 2260 kcal, the head count ratio showed that about 61% of the households were food secure with an average daily per capita calorie consumption 3195.50 kcal, while 39% were food insecure with an average daily per capita calorie consumption of 1530.64kcal. There was a surplus index of 0.28 and a shortfall index of -0.34. This implies that food insecure households fell short of recommended calorie intake by 34%, while food secure households exceeded the calorie requirement by 28%.

Food insecurity coping strategies adopted by crop farmers in Kaduna State

The distribution of farmers according to food insecurity coping strategies is presented in Table 3. The study reveals that about 28% of the crop farmers studied adopted limiting size of food consumed as the coping strategy. This ranked first among the coping strategies adopted by farmers. Also, about 24%, 18% and 24% of the crop farmers mentioned changing crop varieties, engagement in non-farm income generating activities such as building and bricklaying, respectively as their coping strategies. This finding agrees with the study conducted by CEEPA (2006) who found that the use of different planting dates, engagement in non-farm

jobs were the coping strategies adopted by farmers in Africa. Borrowing money from friends and relatives ranked 4th among other coping strategies. Only about 19% of the respondents diversified into animal production as a coping strategy adopted.

Table 1: Socio-economic characteristics of the farmers in Kaduna State

Socio-economic attributes	Frequency*	Percentage
Age		
21 – 30	43	17.92
31 – 40	107	44.58
41 – 50	45	18.75
51 – 60	26	10.83
Above 60	19	7.92
Total	240	100
Years of education		
Primary school	41	17.08
Secondary school	105	43.75
Tertiary education	46	19.17
Adult education	10	4.17
Quranic education	38	15.83
Total	240	100
Household size		
1 -5	38	15.83
6 – 10	100	41.67
11- 15	66	27.50
16 – 20	36	15.00
Total	240	100
Amount of credit received (₦)		
No credit received	26	10.83
20,000 – 40,000	32	13.33
40,001 – 60,000	38	15.83
30,001 – 40,000	10	4.17
40,001 – 60,000	116	48.33
60,001 – 80,000	10	4.17
>80,000	8	3.33
Total	240	100
Number of extension visits/Year		
None	52	21.67
Once	128	53.33
Twice	50	20.83
Three times	10	4.17
Total	240	100
Farming experience (years)		
1 - 10	122	50.83
11 - 20	61	25.42
21 - 30	40	16.67
31 and above	17	7.08
Total	240	100
Years spent in the cooperative(s)		
Not belong to any cooperative	110	45.83
1-10	70	29.17
11-20	41	17.08
Total	240	100

Source: Field survey, 2015

Table 2: Distribution of households according to their food security status

Statistical estimate	Food secure	Food insecure
Frequency	146	94
Average daily calorie intake (kcal)	3195.50	1530.64
Maximum daily calorie intake	6539.44	2258.50
Minimum daily calorie intake	2276.46	804.50
Shortfall/surplus index (P)	0.28	-0.34
Head count ratio (H)	0.61	0.39

Source: Field survey, 2015; n = 240

Table 3: Distribution of farmers according to food insecurity coping strategies adopted

Coping strategies	Frequency*	Percentage	Rank
Limiting size of food consumed	92	38.33	1 st
Changing crop varieties	80	33.33	2 nd
Engagement in non- farm income generating activities	60	25.00	3 rd
Borrowing money from friends and relatives	58	24.17	4 th
Diversify into animal production	45	18.75	5 th

Source: Field survey, 2015; * = Multiple responses

Table 4: Multinomial logit regression result showing relationship between socio-economic attributes and food insecurity coping strategies adopted by crop farmers in Kaduna State

Variables	Coefficient (γ)	Standard error (SE)	t value (γ /SE)
Constant	0.6241	0.2145	2.9096
Age (X ₁)	-0.0644**	0.0305	-2.1115
Years of education (X ₂)	0.0604***	0.0201	3.0050
Household size (X ₃)	0.0302	0.0415	0.7277
Amt. of credit received (X ₄)	0.2406***	0.0462	5.2078
Extension visits (X ₅)	0.4980***	0.1800	2.7667
Years of experience (X ₆)	0.0070	0.0204	0.3910
Years spent in cooperatives (X ₇)	0.4150**	0.1600	2.5938

Source: Field survey, 2015

Log-Likelihood = -132.54; Chi square = 76.28**; *** = Significant at 1% level of probability; ** = Significant at 5% level of probability

Relationship between socio-economic attributes and food insecurity coping strategies adopted by farmers

The result of relationship between socio-economic attributes and food insecurity coping strategies is presented in Table 4. The study reveals that age, years of education, amount of credit received, extension contact and years spent in cooperative had significant influence on food insecurity coping strategies adopted by farmers in Kaduna State. The likelihood ratio test of the hypothesis that the coefficient of all the explanatory variables are zero has a chi squared value of 76.28. This suggests that the estimated model is highly significant at 1% level of probability, with a log likelihood of -132.54. Thus, indicating a well fitted model.

The result also shows the coefficient of age as negatively related to the number of (P = 0.05) of coping strategies adopted. This implies that an increase in the age of farmer decreases the probability of the farmer adopting more coping strategies to food insecurity. This agrees with the findings of Reichwage (2010) who observed that age of household has significant impact on food insecurity coping strategies. Also, years of education was significant (P = 0.01) and positive to number of food insecurity coping strategies adopted. This implies that the more educated the farmer is, the higher the probability of adopting more coping strategies to food insecurity. This also agrees with the findings of Kuwornu *et al.* (2011) where it was observed that the level of education greatly increases the probability of adopting a particular technology and coping strategies. Amount of credit received was positive and significant (P = 0.01). This implies that an increase in the amount of credit received will increase the probability of adopting more food insecurity coping strategies. This is in line with *a priori* expectation that the more access a farmer has to credit, the more the ability of the farmer to diversify. Extension visits was positive and significantly influenced the number of food insecurity coping strategies adopted (P = 0.01). Years spent in cooperatives also positively influenced adoption of coping strategies. This implies that increase in the years spent in cooperatives increases the probability of adopting more food insecurity coping strategies to crop production.

Conclusion

The study concludes that there is significant relationship between socio-economic attributes and food insecurity coping

strategies adopted by farmers in Kaduna State. However, developing food insecurity coping strategies is crucial in reducing food insecurity, hunger and poverty in Kaduna State. Rural Nigeria: An Assessment of the Challenges, Information Needs, and Analytical Capacity. *International Food Policy Research Institute (IFPRI)*. Based on these findings, the following recommendations were advanced:

1. Since about 22% of the farmers did not receive extension visit, it was therefore recommended that the number of ADP extension staff should be increased so that extension staff visit to farmers could be at least three times a year. This will provide effective extension visits to farmers so as to give advice on different ways to cope with food insecurity in the state.
2. Government should provide incentives to farmers such as price ceilings and price floors and also buy surpluses from farmers. This will motivate farmers to produce more than enough that will take care food insecurity in the state.
3. Also, about 46% of the farmers did not belong to any cooperative. Hence, it was therefore recommended that ADPs in the state should encourage the farmers to form cooperatives and pull their resources together to assist them in the purchase of farm inputs to enhance their productivity and food security.

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