Analysis of Food Security and Coping Strategies among Maize Based Farmers in Niger State, Nigeria

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ABSTRACT

The study was conducted to assess food security among maize based farmers' and their coping strategies in Niger State, Nigeria. To achieve this, 125 maize based farmers were randomly selected from two villages each from Paikoro, Shiroro and Bosso Local Government Areas of the state. The data obtained were analyzed using descriptive statistics, food security index and the logit model analysis. The result revealed that 85.6% of the respondents were male and 93.6% of the respondents were married, mean age of the respondents was 44 years with only 3.2% between 21-30 years. Also the respondents in the study area were literate (76.0%), 76.0% of farmers owned the land they used for farming. Majority (72.0%) of the respondents used their own savings in financing farming activities; the mean household size was 7 persons. Furthermore, 77.6% did not have access to formal credit while 22.4% had access to credit. The result of their food security status shows that majority (64.8%) of the respondents were food secure while 35.2% were food insecure. The result of the logit analysis revealed that number of years spent in school, farming experience, annual income from farming and non-farming activities were significant and positively influenced the food security status of the farmers. Coping strategies adopted against food insecurity by the respondents were intercropping, participation in off-farm jobs, reduction in the quantity of meals eaten in a day. It was recommended that maize based farmers should use more modern technologies to increase production and more youth participation in order to remain food secured.

Key words*: food security, maize-based, logit, coping strategies*

INTRODUCTION

Maize (*Zea mays L.*) is the third most important cereal crop next to rice and wheat and has the highest production potential among the cereals. It belongs to the grass family *Gramineae*, is believed to have originated from Mexico or Central America and spread to West Africa with early European traders in the 16th century (Sahid, 2016).

In Nigeria, the total land area maize is grown is over 6.02ha with an annual production of 12.76 million MT in 2018 (Egwuma *et al*., 2019). Maize is used for the production of indigenous and commercial food products that are relished for their unique and distinctive flavours. It is eaten fresh or milled into flour and serves as a valuable ingredient for baby food, cookies, biscuits, ice cream, pancake mixes, livestock feed and a variety of traditional beverages (Sahid, 2016).

Majority of maize producers in Nigeria are smallholders (males and females) producing more than 70% of the nation's maize requirement with few large scale commercial producers (National Agricultural Extension Research and Liaison Services, 2014). However even with the above data there is still a serious challenge to sustainable production of sufficient food, fibre, feed and bio-fuel to meet global demand. According to FAO (2015), the population of the world is increasing rapidly; it may be more than 9 billion in 2050. Presently nearly one billion people are undernourished, hungry and living without adequate calories (PAI, 2015). The food insecurity situation has however become however become worsen with the passage of time due to the wide gap between the national supply and demand for food (Jabo *et al*., 2014).

Food security according to FAO (2015) exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. When this situation does not exists at households, community or at country levels then food insecurity is said to be. On the other hand coping strategies can be described as defense mechanisms, active ways of solving problems and methods for handling resources for short term responses (Wisner *et al*., 2003). It involves according to Snel *et al.,* (2001) a conscious assessment of alternative plan of action. In other words coping strategies are the devices that households employed when the quantity of food available to them is not enough. Many researches in Nigeria and in the study area on food security has been among farming households in general (Yisa *et al*; 2020, Ibrahim *et al*; 2016, Irohibe *et al*; 2014, Olagunju *et al*; 2012, Ojogho, 2010);

while few are among crop (maize) specific farmers (Adepoju *et al*; 2018, Idi *et al*; 2019). Therefore this research aim is to analyse the food security status and coping strategies among maize based farmers in Niger State, Nigeria.

The specific objectives are (i) identify the socio-economic characteristics of households in the study area; (ii) determine the food security status of maize farmers; (iii) identify factors influencing food security status of households; and (iv) identify coping strategies used by households against food insecurity.

RESEARCH METHODOLOGY

Study areas

The study was conducted Paikoro, Shiroro and Bosso Local Government Areas of Niger, Nigeria. Niger State is located between latitudes 8^o22^I N and $11°$ 30^I N and longitude $3°$ 30^I E and $7°$ 20^I E (NSBS, 2012). The State is located in the North central zone along the Middle Belt region of Nigeria. The state has a population of about 5,556,200 individuals as projected by the Niger state bureau of statistics (NSBS, 2016). Niger state is classified as one of the largest states in the country spanning over 86,000km2 in land area with 80% of the land mass conducive for agriculture (Tologbonse, 2008). With 9.30% of the total land area of the country, Niger state is not only divided into three agricultural zones under climatic features containing nearly all classes of soils of the savannah regions of West Africa (Tologbonse, 2008). Niger state has over the years, remained a leading contributor to agricultural productivity in the country at the regional, and state levels as stated by the Federal Ministry of Agriculture and Rural Development & National Bureau of Statistics (FMARD/NBS, 2012).

Sampling technique and sampling size

A multistage sampling technique was used in the selection of the respondents for this study. The first stage involved the purposive selection of three Local Government Areas known for maize production namely; Paikoro, Shiroro, and Bosso Local Government Areas.

The second stage involved the random selection of two districts in the L.G.A. The third stage involves the random selection of two villages from each of the selected districts. The fouth stage involved the selection of 125 maize farmers based on 5% of the total sample frame of 3100 maize farmers.

Analytical Techniques

Data were analysed using both descriptive and inferential statistics. Households were grouped on the basis of their socio-economic characteristics using table, frequency and percentages. The percentage was used to represent the population of food secure and food insecure household population within socio-economic classes. The tables were used to represent all information about respondents, food insecurity incidence and the different results of analysis.

Food Security Index

The households were classified into food secure and food insecure households using Food Security Index (FSI), which was used to established the food security status of households. The food security of the household were obtained using equation 1

$$Fi = \frac{per capita food expenditure for the ith household}{\frac{2}{3} mean per capita food expenditure of all household}$$ ------------------------- (1)

Where,

Fi= food security index

Fi $\geq$ 1= food secure in the household, and when

Fi $\leq$ 1= food insecure in the household.

A food secure household is therefore, that whose per capita monthly food expenditure fall above or is equal to two-third of the mean per capita food expenditure. On the other hand, a food insecure household is that whose per capita food expenditure falls below two-third of the mean monthly per capita food expenditure. This method was adopted by Adepoju *et al*, (2018).

Logit Regression Model

On the basis of food security status the logit regression model was used to determine factors influencing food security among households, which was specified in equation (2)

$$Z_i = b_1x_1 + u_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2)$$

Z_i = the food security status of ith household. (ie $Z_i = 1$, if food secure and 0 if food insecure)

x_1 = vector of explanatory variables.

b_1 = vector of the parameters to be estimated.

u_i = error term.

The empirical logit regression model was specified as in equation (3)

$$Z_i = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + u_i \dots\dots\dots\dots\dots\dots\dots (3)$$

Where X_1 to X_7 (independent variables) specified as:

X_1 = Household food expenditure (naira);

X_2 = age of household head (years);

X_3 = Years in school (years);

X_4 = Years in farming (years);

X_5 = Marital status (1 = married, 0 = others);

X_6 = Annual income from farm activities (Naira);

X_7 = Distance to market (Km);

X_8 = Land acquisition (1 = Hired/purchase, 0 = owned/gift);

X_9 = Extension service (1 = Yes, 0 = No);

X_{10} = Sex (1 = male, 0 = female);

X_{11} = Annual income from off- farm activities (Naira); and
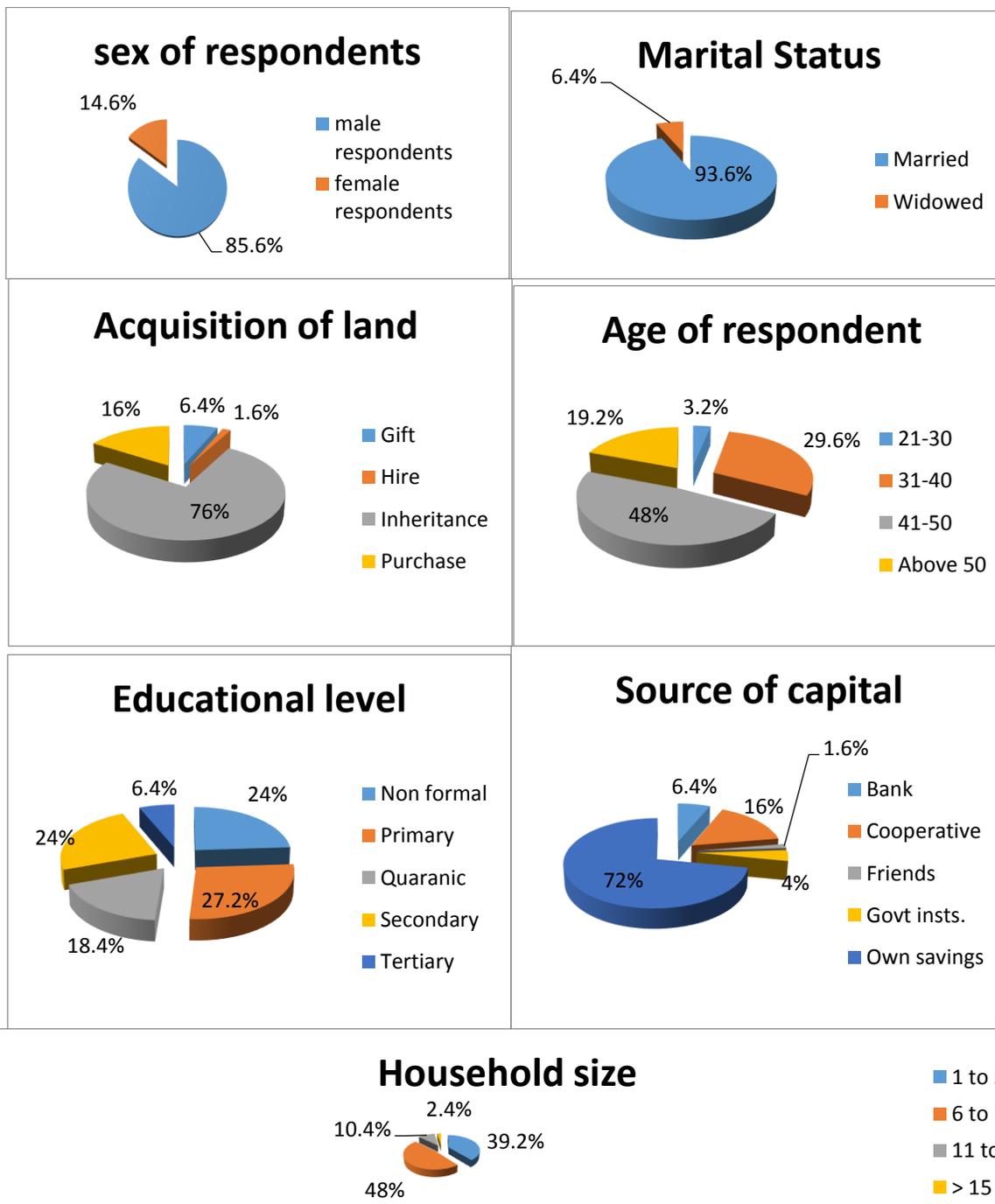
X_{12} = Family labour (Mandays).

u_i = Error term

RESULTS AND DISCUSSION

Socio – economic characteristics of respondents

The socio-economic characteristics of respondents are presented in figure 1. The result revealed that 85.6% of the respondents were male while 14.4% were female. This can be attributed to the tedious nature of maize farming activities. This agrees with the findings of Nwibo and Mbam (2012) and Umar (2014). About 93.6% of the respondents were married while 6.4% were widowed. This implies that the farmers may have extra hands he could use in the farming activities especially if they are of working age. This is in consonance with Umar (2014). The mean age of the respondents was 44 years with 48.0% between the age range of 41 -50 years, 29.6% between 31 – 40 years, 19.2% above 50 and 3.2% between 21 – 30years. This implies that the farmers were still in their active age and have energy to carry out farm activities. The results also show that youth's participation in maize farming in the study areas is very low. Also the respondents were literate (76.0%) with 27.2% attaining primary education, 24.0% attaining tertiary education and 24.0% had no form of formal education. Education enhances individual farmers' ability to make accurate decision on the adoption of technologies and practices in the farm (Adebayo, 2010). About 76.0% of farmers owned the land they used for farming, 16.0% own their land through purchased, 6.4% had their farm land as gift while the remaining 1.6% hired the land they used for farming. This implies that the farmers have land to expand the farming business. Majority (72.0%) of the respondents used their own savings in financing farming activities while 16.0% obtained loan from cooperatives, 6.4% from bank, 4.0% from government institutions and 1.6% from friends. This implies that farmers did not have access to both formal and informal credit facilities which might be the reason they are small scale farmers. The mean household size was seven (7) persons with majority of the respondents (48.0%) having household size of 6 -10 persons, (39.2%) having a household size of between 1 -5 persons and 2.4% having household size of above 15 persons. This implies that the farmers have large family who can assist in farming activities.

CHART 1

sex of respondents

14.6%

- male respondents
- female respondents

85.6%

Marital Status

6.4%

93.6%

- Married
- Widowed

Acquisition of land

16% 6.4% 1.6%

76%

- Gift
- Hire
- Inheritance
- Purchase

Age of respondent

19.2% 3.2%

29.6%

48%

- 21-30
- 31-40
- 41-50
- Above 50

Educational level

6.4% 24%

24%

27.2%

18.4%

- Non formal
- Primary
- Quaranic
- Secondary
- Tertiary

Source of capital

1.6%

6.4% 16%

72% 4%

- Bank
- Cooperative
- Friends
- Govt insts.
- Own savings

Household size

2.4%

10.4% 39.2%

48%

- 1 to 5
- 6 to 10
- 11 to 15
- > 15

Food security status

The result from Table 1 show that majority (64.8%) of the respondents were food secured while 35.2% were food insecure. This results tallies with that of Adepoju *et al*., (2018) who found out that food security was more among maize-based farmers in Southwestern Nigeria. This implies that majority of the households in the study areas are potentially food secured, this is might be due to the fact that most rural maize farmers practice mixed cropping and participate in off-farm activities which provide income for the farmers and meeting up with available food for the household.

Table 1: Food Security Classification of Maize Farming Households

Food security status	Frequency	Percentage
Food secure	81	64.8
Food insecure	44	35.2
Total	125	100

Determinants of food security status

The likelihood ratio test was 65.82 with 12 degrees of freedom significant at (P<0.000), this indicates that all the variables included in the model are jointly significant in predicting the households level of food security. The various determinants of food security status of farmers is shown on Table 2. The result revealed that seven (7) variables were significant namely household expenditure, age, years in school, years in farming, annual income from farm activities, distance to market and annual income from off-farm activities.

The result showed that household expenditure was negative and significant at 5% level of probability. This means that the probability (or likelihood) of a maize based farmers to be food secure decreases as the expenditure by the household increases. This is so especially if such expenditures are not for food. The age of the respondents was significant at 1% level and has a negative effect on food security of maize farming households. The implication is that the older farming household heads are less active in increasing productivity and consequently their level of food security.

This finding disputes those of Adepoju *et al*., (2018) and Idi *et al*., (2019), in which they found out that age had positive and significant effect on maize farmers in Southwestern Nigeria and Kaduna state respectively.

The odd ratio obtained for years in school was positive and statistically significant at 5%. This means that an increase in education of the household heads leads to an increase in the likelihood of being food secure. This result is consistent with that of Idi *et al*., (2019). The years of experience in maize farming was positive and significant at 1%. This implied that as the farming experience of the household head increases, the likelihood of the food security of the household to increase. This is so because of the accumulated skills they must have garnered over the years in the production and utilization of maize by the households. This result tallies with that of Adepoju *et al*., (2018).

The annual income from farming was positively significant at 5% which suggests that the higher the income from farming, the higher the chances of the household being food secure. More income by the household will increase the accessibility to food. Distance to market was negatively significant at 5%. This means that the farther the markets are from the farming households the higher the chances of being food secure. This is expected because households need to sell their output in the markets that will give them better income. The odds ratio of annual income from off farm activities had a positive effect on their being food secures with a significance level of 1%. Incomes from other means supplements the farm income and this will increase their likelihood of being food secure. Off farm income also serves as insurance against crop failures.

Table 2: Distribution of respondents according to determinants of food security status

Variables	Coefficient	Standard error	Z-Value
Constant	3.042362	2.08566	1.46
Expenditure(X_1)	-6.62E-06	2.92E-06	-2.27**
Age(X_2)	-0.1377	0.04458	-3.09***
Years in school(X_3)	0.16171	0.062028	2.61**
Years of farming(X_4)	0.128481	0.041623	3.09***
Marital status(X_5)	-1.14333	0.662298	-1.73
Annual income from farm activities (X_6)	6.64E-06	3.18E-06	2.09**
Distance to market (X_7)	-0.75229	0.296205	-2.54**
Land acquisition (X_8)	-1.68257	0.964423	-1.74
Extension service(X_9)	0.443087	0.611154	0.72
Gender (X_{10})	-0.52039	1.079733	-0.48
Annual income from off farm activities (X_{11})	1.55E-05	3.68E-06	4.20***
Family labour(X_{12})	0.004177	0.010354	0.40

LR chi2(12) = 65.82
Prob> chi2 = 0.0000
Pseudo R2 = 0.4223
*** Significant at 1%, level of probability,
** Significant at 5%, level of probability,

Coping strategies against food insecurity

Table 3 revealed the coping strategies adopted against food insecurity by the respondents in the study area. Different strategies were practiced to mitigate and cope during shortfall of food availability and access. It revealed that majority of the respondents adopted intercropping of maize with other crops which was mostly practiced with a mean of 2.04. Other coping strategies were participation in off-farm jobs (2.07), reduction in the quantity of meals eaten in a day (2.45), allowing their children to eat first (2.48), crop diversification (2.64), and sales of animals (2.70). This implies that the best coping strategies the respondents in the study areas adopted were intercropping, participating in off- farm jobs and reduction in quantity of meals eaten in a day. This result is at variance with that of Adetunji, (2019), who found out that reduction of meals were the major coping strategies among arable farmers in North Central Nigeria.

Table 3: Distribution of respondents according to coping strategies

Coping strategies	Very often Frequency (Percentage)	Often Frequency (Percentage)	Undecided Frequency (Percentage)	Not often Frequency (Percentage)	Never Frequency (Percentage)	Mean	Remark
Eating once a day	0 (0.0)	0 (0.0)	5 (4.0)	9 (7.2)	111 (88.8)	4.85	17th
Letting children to eat first	52 (41.6)	32 (25.6)	0 (0.0)	11 (8.8)	30 (24.0)	2.48	4th
Selling of asset	7 (5.6)	0 (0.0)	29 (23.2)	39 (31.2)	50 (40.0)	4.00	11th
Buying food on credit	18 (14.4)	19 (15.2)	13 (10.4)	26 (20.8)	49 (39.2)	3.55	8th
Picking of leftover food at social function	0 (0.0)	2 (1.6)	4 (3.2)	1 (0.8)	118 (94.4)	4.88	18th
Rely on less preferred food	15 (12.0)	53 (42.4)	1 (0.8)	36 (28.8)	20 (16.0)	2.94	7th
Borrow food or rely on help from friends or relatives	12 (9.6)	18 (14.4)	13 (10.40)	21 (16.8)	61 (48.8)	3.81	9th
Gather wild food	0 (0.0)	4 (3.2)	8 (6.4)	12 (9.6)	101 (80.8)	4.68	15th
Consume seed stock held for next season	6 (4.8)	6 (4.8)	20 (16.0)	42 (33.6)	51 (40.8)	4.01	12th
Send household members to eat elsewhere	2 (1.6)	14 (11.2)	39 (31.2)	2 (1.6)	68 (54.4)	3.96	10th
Send household members to beg	2 (1.6)	2 (1.6)	7 (5.6)	3 (2.4)	111 (88.8)	4.81	16th
Restrict consumption of adults	8 (6.4)	2 (1.6)	5 (4.0)	14 (11.2)	96 (76.8)	4.50	14th
Reduce quantity of meals eaten in a day	67 (53.6)	9 (7.2)	7 (5.6)	12 (9.6)	30 (24.0)	2.45	3rd
Skip entire days without eating	9 (7.2)	8 (6.4)	10 (8.0)	6 (4.8)	92 (73.6)	4.31	13th
Crop diversification	45 (36.0)	25 (20.0)	9 (7.2)	22 (17.6)	24 (19.2)	2.64	5th
Intercropping	45 (36.0)	56 (44.8)	4 (3.2)	14 (11.2)	6 (4.8)	2.04	1st
Participate in off-farm jobs	60 (48.0)	38 (31.2)	12 (9.6)	15 (12.0)	0 (0.0)	2.07	2nd
Sell animals	34 (27.2)	39 (31.2)	3 (2.4)	29 (23.2)	20 (16.0)	2.70	6th

CONCLUSION AND RECOMMENDATIONS

Maize based farmers in the study area were in their middle ages; about 3.2% of the respondents were youth. Most of the farmers were food secured, while the major determinants of their food security status were farming experience. Intercropping and participation in off-farm enterprises were the major coping strategies employed by the farmers. It was therefore recommended (i) that maize farmers need to implore more modern production technologies to boost productivity, (ii) more youths needs to be encouraged to go into maize farming, (iii) farmers are advice to participate in all year farming activities.

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