

Original Research Paper

Food Security Determinants among Urban Food Crop Farming Households in Cross River State, Nigeria

ABSTRACT

Aims: The study investigated food security determinants among urban food crop farming households in Cross River State, Nigeria.

Study design: The study utilized a two-stage sampling technique to obtain a sample of 217 urban food crop farming households

Place and Duration of Study: The study was conducted in three urban areas in Cross River State, namely: Calabar, Ikom, and Ugep. Cross sectional data were collected through well structured questionnaires and oral interview.

Methodology: The data were analyzed using headcount index, food insecurity gap index, food surplus gap index as well as logistic regression.

Results: The result showed that only 52.5% of urban food crop farming households were food secure while 47.5% were food insecure. The food insecurity gap and food surplus index showed that food secure households exceeded the food security line by 44% while 53% of food insecure households fall below the poverty line. The logistic regression result revealed that, years of formal education, farming experience, age of farmers, farming as main occupation, household size, income from farm and output of food crops produce were major determinants of food security status of urban farming households in the study area.

Conclusion: The study recommend the reduction in household size as well as the evolution of a well articulated and proactive modern urban farming and food policy strategy that would integrate and reformed the existing indigenous urban farming practices as the way out.

Keywords: Urban farming, food security, food crops, logistic regression, determinants, Cross River State

1. INTRODUCTION

All over the world, except in sub-Sahara Africa where the opposite holds, urbanization is associated with economic growth. Paradoxically, sub-Sahara Africa has the highest rates of urbanization globally and more than half of its entire population will be living in cities during the next two decades. This situation implies that in West Africa, especially Nigeria, the problem of urban poverty, unemployment and urban food insecurity will become exacerbated rather than ameliorated by the phenomenon. As these problems persist, the niches for activities that alleviate them also take hold and possibly expand. One of such activities to which urban households have turned for food, employment and income is urban agriculture [1]. Urban agriculture, defined in simple terms is the growing, processing, and distribution of food and other products through intensive plant cultivation and animal husbandry in and around cities [2]. It includes green belts around cities, farming at the city's edge, vegetable

plots in community gardens, and food production in thousands of vacant inner-city lots. According to [3] urban agriculture is an important supply source in developing countries food systems. It represents a critical food security valve for poor urban households; providing cheap, simple and flexible tool for productively using open urban spaces, generating employment and income, adding value to agricultural products.

Food security is define as a situation that 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 [4]. In Nigeria, the percentage of food insecure households was reported to be 18% in 1986 and 40% in 2005 [5]. Recently, [6], asserted that the number of hungry people in the country is over 53 million, which is about 30% of the country's total population of roughly 150 million; and 52% live under the poverty line. The Global Food Security Index (GFSI), of the Economist Intelligence Unit has ranked Nigeria as the 80th among 105 countries with food affordability, availability and quality. According to the Index, Nigeria recorded weak scores in the areas of Public expenditure on agricultural research and development, 0.0; presence of food safety net programs, 0.0; gross domestic product per capita, 3.0; proportion of population under global poverty line, 9.6; food consumption as a share of household expenditure, 9.6 and protein quality, 12.8 [7]. These are matters of grave concern largely because Nigeria was self sufficient in food production and was indeed a net exporter of food to other regions of the continent in the 1950s and 1960s. Agriculture remains the largest sector contributing 40% of GDP and employing about 70% of the labour force, bulk of which are subsistence farmers [8]. According to findings of [9] in 2009, more than ₦400 billion was injected into the sector, while in 2010, agriculture accounted for only 3.7 percent of budgetary allocation (recurrent ₦34.4 billion and capital ₦49.9 billion). Despite the huge financial investment in the sector and 51 years of independence, many Nigerians cannot afford three square meals a day. The slow growth of agricultural and food production has resulted in growing food imports and food insecurity in the country. Hence, apart from complimenting rural food supplies which invariably reduces hunger and poverty, boosting urban agriculture would reduce the huge import bills, enhances household's incomes and reduces some wasteful and unfriendly environmental costs associated with transportation and packing of agricultural products.

Unfortunately, several factors are thought to limit the food security status of urban food crop farming households. Identification and understanding of these factors would equip urban policy makers with the true picture of local urban practices that are economically viable and would assist in tackling the food security problems in the sub sector. Against this backdrop, the study provides answers to the following research questions: Are the sampled urban food crop farming households food secured? What factors affect the food security status of urban farming households in the study area? Based on the above research questions, the study specifically investigated factors that determine the food security status of urban farming households in Cross River State, Nigeria.

1.2 Literature Review

Numerous researches have been carried out on the determinants of food security in Africa. [10] investigated food insecurity determinants among rural households in Nigeria using farm-level data collected from 220 rural farm households from Benue state. The study revealed that farm income, nonfarm income, share of own produced food in total quantity consumed, farm size, household size, transfer income, age, years of formal education, household expenditure on education, access to agricultural extension services, and household food expenditure were major determinants of households food security. [11] uses the logistic regression model to examine the determinants of food security among rural households in Kwara State, Nigeria. Their findings showed that farm size, gross farm income, total nonfarm income and household size were significant determinants of household's food security in the

study area. [12] investigated changes in household food security and poverty status in PROSAB (Promoting Sustainable Agriculture in Borno State) area of Southern Borno State, Nigeria. The PROSAB project used a participatory approach to promote improved varieties of cereals and legumes along with improved crop management practices. The estimated food insecurity lines were ₦2160.94 and ₦1748.99 from households in PROSAB and non-PROSAB participating communities. These food insecurity lines were expected to meet the minimum recommended daily energy level (2250 kilocalories) of an adult/month in the participating communities and 61% in the non-participating communities. Based on these food insecurity lines, 49% of households were classified as food insecure in the participating communities and 61% of households in the non-participating communities. The aggregate expenditure gap or expenditure shortfalls of the food-insecure households were 51.3% and 24.5% of the food insecurity line for PROSAB and non-PROSAB communities. The probit regression result indicated that household size; cost of hired labor, participation in PROSAB activities and non-agricultural income had significant positive effects on the food security status of the household. [13] used the logit model to assessed location specific socio-economic factors influencing food insecurity of households in urban areas of Ogbomoso metropolis in Oyo State, Nigeria. From the estimated food insecurity line, 60% of the sampled households were food insecure. Also, family size, annual income, amount of credit received, age of household head, farm size and livestock owned showed theoretically consistent and statistically significant effect on food security status of the respondents. [14] analyzed food insecurity status of rural households during post planting seasons in Nigeria. They authors found out that almost half (49.4%) of rural households in the country were food insecure. Identified key rural food insecurity determinants were: gender of household head, tertiary education of household head, access to both formal and informal credit and remittances, household size, dependency ratio and living in the North-Central, North-East and South-West geopolitical zones of the country. [15] estimated the food security status and identify the determinants of food security among households receiving government grants in a township of Kwakwatsi, South Africa. The results of the regression analysis showed total household income, household size, employment and marital status of the household head and employment status of the spouse as important determinants of food security in the area. [16] in a study of household food security in Vihiga district of Kenya also reported a significant influence of household income, number of adults, ethnicity, savings behavior, and nutrition awareness on household food security.

2. MATERIAL AND METHODS

2.1 The study area

Cross River State occupies an area of about 22,342.176 square kilometers [17]. It is located on Latitude 5° 25'N and longitude 25° 0' E. The soils of Cross River State are ultisol and alfisol but predominantly ultisol, suitable for pineapple production. Cross River State is bounded on the North by Benue State, South by Bight of Bonny, and in the East by Ebonyi and Abia States, while in the West by Republic of Cameroun [18]. About 2,888,966 people inhabit the area, of which the Efiks, Ejaghams and Bekwarras are the major ethnic groups [19]. Cross River State has the largest rainforest covering about 7,290 square kilometers. It is described as one of Africa's largest remaining virgin forest harboring as many as five million species of animals, insects and plants. The state is located within the evergreen rainforest zone. There are two distinct climate seasons in the area, rainy season, from March to October and dry season from November to February. The annual rainfall varies from 2,942mm to 3,424mm. The average temperature is about 28°C. Cross River State is characterized by the presence of numerous ecological and zoo-geographically important high gradient streams, rapids and waterfalls. Fishing and subsistence agriculture are the

main occupations of the people. Crops grown in the locality include rice, maize, yam, cassava, pineapple, plantain, banana, oil palm, rubber and cocoa among others [19].

2.2 Sampling procedure and sampling size

The population of this study comprises of all urban food crop farming households in Cross River State. Urban food crop farmers are those farmers who cultivated crops like vegetables, root and tubers, and staple crops with one growing season. A two stage sampling technique was used in selecting the sample. The first stage involved the random sampling of three urban areas out of eight major urban areas in Cross River State. The eight urban areas were arranged in an alphabetical order and assign a number to each of them. These numbers were written in separate piece of papers and were put into a basket, then thoroughly mixed. The researcher blindfolded himself, dip his hand into the basket and pick out a number at random. This process continued until three urban areas were selected, namely: Calabar, Ugep, and Ikom. In stage two, a snowball sampling technique was employed to select urban food crop farmers in each urban area. With this approach, the researcher initially contacted few respondents and then asked them whether they know anybody practicing urban farming activities in their residence to recruit future subjects from among the acquaintances. This was done mainly because it was near impossible to get the exact number of urban food crop farmers in each town. The sample size calculator was used to determine the total number of urban farmers that were interviewed. Of a total number of 220 urban food crops farmers sampled, only 217 supplied complete data that were used in the analysis. While sixty seven (67) were interviewed in Calabar, ninety six (96), and Fifty seven (57) were interviewed in in Ikom and Ugep respectively.

2.3 Analytical techniques and variables measurement

To identify the factors influencing the food security status of urban farming households, we carry out 2 stages of analyses; one, we constructed a food security Index (Z_i) and determine the food security status of each household as used by [20]. Second, we used the logit model to estimate the food security status of households as a function of a set of independent determinants. The food security index (Z_i) used to classify households food security status is given by:

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

Where Z_i = food security index (when $Z_i \geq 1$ = food secure ith household, $Z_i \leq 1$ = food insecure ith household)

A food secure household is, therefore, that household whose per capita monthly food expenditure falls 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. Additionally, food insecurity gap index, food surplus gap index and the headcount ratio of food security were calculated for the sample households based on the food security index (Z). The food insecurity gap (P), measures the extent to which food insecure households on average fall below the food security line and the food surplus gap (S), the extent by which food secure households exceeded the food security line. The headcount ratio (H) measures the percentage of the population of household that are food insecure/secure.

$$\bullet \text{ Food insecurity gap index (P)} = \frac{1}{M} \sum_{i=1}^M G_i \text{ where } G_i = \left(\frac{R - Y_i}{R} \right) \dots \dots \dots (1)$$

$$\bullet \text{ Food surplus gap index (S)} = \frac{1}{L} \sum_{i=1}^L G_i \text{ where } G_i = \left(\frac{Y_i - R}{R} \right) \dots \dots \dots (2)$$

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187 • Headcount index (H_{fi}) = $\frac{M}{N}$ (3)

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189 • Headcount index (H_{fs}) = $\frac{L}{N}$ (4)

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191 Where M = number of food insecure households; N = total number of households in the
192 sample; L = number of food secure households; G_i = deficiency or surplus faced by i^{th}
193 households; H_{fs} = headcount index for food secured households; H_{fi} = headcount index for
194 food insecure households; Y_i = monthly per capita expenditure on food item of i^{th}
195 households; R = food security line (₦3, 024.5).

196 Based on the household food security index (Z_i), the logit model was estimated to identify
197 the determinants of food security among farm households. The implicit form of the model is
198 expressed as:

199 $Z_i = \beta X_i + U$ (5)

200 Z_i = Household food security status (food secure households =1, food insecure households =
201 0)

202 X_i = Vector of explanatory variables

203 U = Error term

204 β = Vector of the parameter estimates

205 Xs are explanatory variables and are define as follows: FAM = Farming as main occupation
206 (0=yes, 1= no); MSF = Marital status of farmer (1 for married, 0 for otherwise); FEU =
207 Fertilizer usage (1= yes, 0 = no); SOF = Sex of farmer (1= male, 0 = female); HHS =
208 Household size (number of person); YOE = Years of formal education; EXP = Farming
209 experience (years); AOF = Age of farmer (years); IFF = Income from farm (₦); FAS = Farm
210 size (hectares); OFI = Off farm income (₦); OFC = Output of food crops (grain equivalent
211 per Kg)

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213 On apriori ground, while $\beta_1, \beta_3, \beta_6, \beta_7, \beta_9, \beta_{10}, \beta_{11}, \beta_{12}$ are expected be positive; β_5 is
214 expected to be negative and $\beta_2, \beta_4 \beta_8$ are expected to be either negative or positive.

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217 3. RESULTS AND DISCUSSION

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219 Table 1 shows the summary of food security indices of the respondents. Households were
220 profile into food secure and food insecure groups based on their per capita food expenditure.
221 This method has been applied in several studies whose main focus is to determine the food
222 security status of households ([20]; [21]). The food insecurity line is defined as two-third of
223 the mean per capita food expenditure of the total households studied. The estimated food
224 security line was ₦3,024.50. Therefore, household whose per capita expenditure fall below
225 ₦3,024.5 are designated food insecure while households whose mean per capita food
226 expenditure equals or is greater than ₦3, 024.5 are food secure. The results in table 1
227 shows that 52.5% of urban food crop farming households were food secure while 47.5%
228 were not food secure. The food insecurity gap and food surplus index which measure the
229 extent of deviation from the food security line, shows that the food secure households
230 exceeded the food security line by 44%, while 53% of food insecure households fell below
231 the poverty line. Also, the mean per capita expenditure for all households was ₦7365.53 and
232 ₦1408.40 for food secure and food insecure households' respectively. This empirical finding
233 agrees with the results of [12] and [13].

234

235 Table 1: Summary of food security indices for urban food crop farming households in the
236 study area

Food Security indices	Food Secure	Food Insecure	All
Percentage of household	52.5	47.5	100
Number of households	114	103	217
Head count ratio (H)	0.525	0.475	-
Food insecurity gap/surplus gap index	1.44	0.53	-
Mean per capita expenditure	₦7365.53	₦1408.40	₦8773.93

Food insecurity line is ₦3, 024.5

Source: computed from field data (2012)

Table 2 present the maximum likelihood estimates of the logit model describe in equation 5. The result shows that in terms of predictive efficacy, the model predicted the food security status of urban food crop farming households with 81.63% accuracy. The estimated logit regression model gave the McFadden R-square of 0.394, which implies that all the explanatory variables included in the model were able to explain about 39.4% of the determinant of the food security status of urban food crop farming households. The log-likelihood ratio (LR) statistic (-87.25) is significant, meaning that the explanatory variables included in the model jointly explain the probability of the determinants of food security status of urban food crop farming households. The information criteria also attest to the reliability of the logit model in this study. This implies that factors that influence the food security status of urban food crop farming households are better expressed in the specified logit model. The average marginal effect was 0.51, this implies that on average, the probability that urban food crop farming households will be food secured is 51%. This result further strengthens the headcount ratio, which shows that 52.5% of the respondents were food secure in the study area.

Table 2: Logit model estimates of determinants of food security status of urban food crop farming households in Cross River State.

Variables	Coefficients	Standard errors	Z-value	Odds estimates	Marginal effect
Constant	-0.9794	1.5098	0.65	-	-

FAM	4.22e-06	2.71e-06	1.55*	1.0000	1.05e-06
MSF	0.0217	0.8429	0.03	1.0219	0.0054
FEU	0.1937	0.5124	0.38	1.2137	0.0482
SOF	-0.5775	0.4156	1.39	1.7815	-0.1433
HHS	-0.4774	0.0846	5.64***	1.6119	-0.1192***
YOE	0.1328	0.0715	1.85*	1.1420	0.0332*
EXP	0.0469	0.0264	1.80*	1.0480	0.01174*
AOF	0.5108	0.0264	1.93**	1.6666	0.0127**
IFF	5.06e-06	2.96e-06	1.71*	1.0000	1.26e-06*
FAS	-0.3584	0.2990	1.20	1.4310	-0.0895
OFI	4.22e-06	2.71e-06	1.55	1.0000	1.05e-06
OFC	0.00053	0.00019	2.73***	1.0005	0.00013***

Log-likelihood = -87.2583

Average marginal effect = 0.51

LR χ^2 (12) = 113.49***

Number of cases correctly predicted = 177(81.6%)

McFadden R^2 = 0.3941

Source: computed from field data (2012)

The empirical result revealed that the slope and log odd coefficients of years of formal education (YOE) was statistically significant at 10% and had a positive effect on the food security status of urban food crop farming households. The odd interpretation implies that every unit increase in farmers' years of formal education, the odd in favour of households to be food secure increase by 1.1420 times or about 14.2%. The result implies that the more educated urban food crops farmers are the more likely that their households will be food secure. This is because education is a social capital which has positive impact on household ability to make good and well-informed production and nutritional decisions. This result agrees with [22], [16], [10] and [14].

Also, the slope and the log odd coefficients of farming experience (EXP) was statistically significant at 10% and had a positive effect on the food security status of urban food crop farming households. This agrees with the apriori expectation. The odd interpretations imply that for every unit increase in farming experience, the odd in favour of household food security increases by 1.0480 times or about 4.80%. This means that as farming experience of urban food farmers' increases, the chance of households being food secure increases too. This can be attributed to the increase tendency of innovation adoption over the years.

The slope and the log odd coefficients of age of farmers (AOF) was statistically significant at 5% and had a positive effect on the food security status of urban food crops farming

households in the study area. This agrees with the apriori expectation. The odd interpretation means that for every unit increase in farmer's age, the odd in favour of household's food security increases by 1.666 times or 66.6%. Increase in the farmer's age implies increase in exposure and probably farming experience. Which will in turn boost household's food crop production and therefore increase the chance of urban food crop farming household's food security. This result is in consonant with the findings of [13] and [10].

However, the log-odd coefficient of farming as main occupation (FAM) was statistically significant at 10% and had a positive effect on food security status of urban food crops farming households in the study area, thereby agreeing with the apriori expectation. This means that urban food crop farmers whose main occupation are not farming increases the chance of households food security as compare to those farmers whose main occupation is farming only. The odd ratio of urban farmers, whose main occupation was not farming were 1.00000422 times or 0.0004% higher than those urban farmers whose main occupation was farming. This implies that farming not being the main occupation of urban food crop farmers' increases the chances or probability of households being food secure. This finding further strengthens the fact that urban farming serves as a niche were poor urban households turn to, for employment and additional income.

The slope coefficient of household size (HHS) was statistically significant at 1% level and had a negative relationship with the food security status of urban food crop farming households. This means that as household size increases, the chance or probability of household food security reduces. In another language, large size households are more likely to be food insecure than small size households. The result implies that a unit increase in household size reduces the odd of household food security by 1.6119 times or 61.19%. Alternatively, a unit decrease in household size increase the odd of household food security by 61.19%. This is because household size increases the number of consumers putting pressure on household resources particularly food and household with high dependency ratio are particularly prone to food insecurity. This result agrees with the findings of [12] and [13].

The log-odd coefficient of income from farm (IFF) was statistically significant at 10% and had a positive effect on food security status of urban food crops farming households in the study area. This agrees with apriori expectation. The odd interpretation means that for every unit increase in farm income the odd in favour of households food security increase by 1.00000506 times or 0.0005%. This indicates that the higher the household farm income, the higher is the probability that the household would be food secure. This attests to the fact that urban farming is another source of income for urban farming households and contributes significantly to household food security. This result agrees to the empirical findings of [11].

The coefficient of output of food crops (OFC) was statistically significant at 1% and had a positive effect on food security status of urban food crops farming households in the study area. The odd interpretation means that for every unit increase in output of food crops produce by urban farming households the odd in favour of household food security increase by 1.0005 times or 0.05%. This indicates that the higher the amount of food obtained from own production, the higher the likelihood of household food security. This result also agrees with the findings of [10].

4. CONCLUSION

The study investigated the various determinants of food security status among urban food crop farming households in Cross river State, Nigeria. Numerous researches have shown the potential of urban agriculture in, increasing household's income, providing employment for the urban poor, and making cheap and nutritious food available for household consumption in developing countries, thereby addressing the food security challenges. This study revealed that a greater percentage of respondents (47.5%) were food insecure, implying the prevalence of food insecurity in our urban areas. Also, the major determinants of food security status of urban farming households in the study area were; years of formal education, farming experience, age of farmer, farming as main occupation, household size, income from farm and output of food crops produce by urban food crop farmers.

Based on the findings of this study, the following recommendations are given:

1. Effort should be directed towards reducing household size in the study area. This can be achieved through enlightenment programmes such as family planning and birth control measures.
2. In order to enhance the productivity of urban farmers, a well articulated and proactive modern urban farming and food policy strategy that would integrate and reformed the existing indigenous urban farming practices should be evolved. This can be achieved through investment in research and development, encouraging the use of improved varieties, adoption of better land management strategies as well as frequent visit of extension agents

COMPETING INTERESTS

All the contributing authors have declared that there is no competing interest among us.

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