Analysis of Household Participation in Urban Agriculture: Empirical Evidence from Urban Households in Kogi State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author MKI designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author UMS managed the analyses of the study. Author MH managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The study analysed household participation in urban agriculture in Kogi State, Nigeria. It specifically; described the socioeconomic characteristics of the respondents; determined the factors that influence household participation in urban agriculture; and determined the effect of urban agriculture on household income. Simple random sampling technique was used to select 60 respondents each from four purposively selected peri-urban/urban centres in Kogi State: Lokoja (Zone A), Anyigba (Zone B), Okene (Zone C), and Idah (Zone D). Primary data obtained through questionnaire administration were analysed using descriptive and inferential statistical tools. Findings from the study revealed that 61.7% of the respondents were males and a mean age of 43 years was recorded. Married (90%) household heads dominated the respondents with a mean household size of 7 members. Education (β = -0.862), dependent (β = 1.904), marital status (β = 2.544), access to sufficient food (β = -2.495), employment status (β = 1.307) and access to land (β = 0.505) statistically influenced household participation in urban agriculture, while the OLS output indicated that urban farm income (β = 17.539) and non-farm income (β = 848.798) had significant

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effect on total household income. The study concluded that urban agriculture has the potential of improving the livelihood of urban dwellers. The study therefore recommends the integration of urban agriculture into urban development plan; easy access to land and other production inputs.

1. INTRODUCTION

Until recently, poverty was synonymous with rural areas but the rapid urbanization and the high incidence of rural-urban migration has informed the existence of urban poor. Apparently, the role of urban agricultural practices in the food supply of cities and towns is not in doubt. Participation in urban agriculture includes the growing of plants and raising of animals within and around the cities. In Nigeria and Kogi State in particular, most of the agriculture is undertaken in the rural with major components of crops and livestock.

The contribution of urban agriculture to urban food security and poverty alleviation has recently become a subject of attention for policy makers. A major function of urban agriculture is food supply and income generation in the cities, but increasingly; urban agriculture also plays a role in environmental, landscape and biodiversity management and in providing recreational services, among others [1].

Urban agriculture, a contemporary trend, is gaining prominence especially in developing nations such as Nigeria because it has been discovered to be a viable poverty intervention strategy for the urban poor [2]. Access to adequate food constitutes the most challenging situation facing urban dwellers in Kogi State. This situation could be associated with inflation rate, food price instability and relatively low wages of income earners [3].

Extensive review of literatures revealed studies abounds with respect to urban agriculture in Nigeria [4,5]. In Kogi State, Ibitoye [2] considered the influence of urban agriculture on a section of household income. There is therefore the need to carry out a holistic study on the drivers of household participation in urban agriculture and as well, establish the current relationship between urban agriculture and household livelihood. In view of the gap, the study specifically; described the socioeconomic characteristics of urban households, determined factors that influence household participation in urban agriculture, and ascertained the effect of urban agriculture on household income.

2. METHODOLOGY

This study was carried out in Kogi State, Nigeria. Kogi State is popularly called the Confluence State due to the confluence of River Niger and River Benue at its headquarters. The State lies between latitude 6°30'N and 8°48'N and longitude 5°23'E and 7°48'E. Kogi State has a population of about 4,710,211 people in 2018 (using the state projected growth rate) [6]. The State has land area of about 30,354.74 square kilometers. Out of this total area, the State has 2 Million hectares of cultivable land but only about 0.5 Million hectares are under cultivation and 172, 000 farming families [6].

The target population is peri-urban and urban households in Kogi State. A multistage sampling technique was used for the study. The first stage involved purposive selection of one peri-urban/urban centre from each of the four agricultural zones as delineated by the Kogi State Agricultural Development Project (Kogi ADP). The peri-urban/urban centres selected are: Lokoja (Zone A), Anyigba (Zone B), Okene (Zone C), and Idah (Zone D). A total of four peri-urban/urban centres were used. In the second stage, sixty (60) peri-urban/urban households were selected from each of the centre using a simple random sampling technique. A sample size of 240 respondents was used for the study.

Structured questionnaire was used to collect the primary data. The questionnaire was administered to 240 households in the State using trained research assistants from the four agricultural zones of Kogi ADP. The instrument was designed in line with the stated research objectives. Data collected for this study were analysed using both descriptive and inferential statistical tools. The descriptive statistics such as frequency count, percentages, mean, and mode were used to describe the socioeconomic characteristics of the respondents; while inferential statistics tools such as binary logit analysis, and ordinary least square (OLS) multiple regression analysis were used to determine the factors that influence participation in urban agriculture and the effect of urban agriculture on household income, respectively.
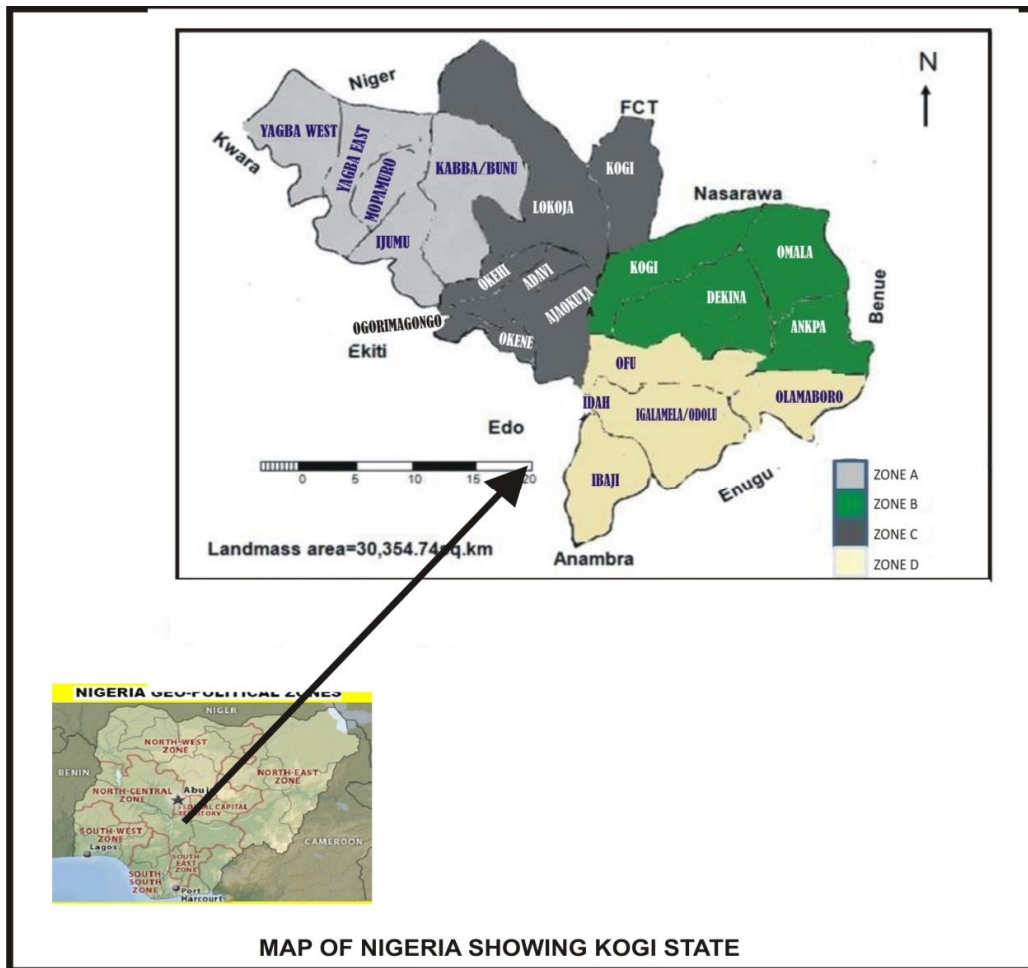
Fig. 1. Map of Nigeria showing the agricultural zones

2.1 Model of Specification

2.1.1 Binary logit model

A binary logit model was used to determine factors that influence household participation in urban agriculture. This model was selected because participation in urban agriculture is a qualitative dependent variable and is measured as a dummy variable (participate = 1, otherwise = 0) hence, one cannot use Classical Linear Regression Model (CLRM). Here in this study, there is a dichotomous dummy variable which is dependent variable. So, Logit model was applied. The logit model used is as specified below;

$$Lny = Ln\ (p/1 - p)$$
$$Ln\ (p/1 - p) = f(\beta_i X_i) + e_i$$

Urban Agricultural Household; an urban household is classified as participating in agricultural activities if at least one adult member (aged 15 to 70 years) of the household is engaged in crop cultivation, livestock rearing and/or fish farming. Here, the dependent variable is binary where:

Y_i	= 1 if household participates in urban agriculture
Y_i	= 0 if household is a non-participant.
P	= Probability of household participating in urban agriculture
1 – P	= Probability of household not participating in urban agriculture
Ln	= Natural logarithm function.
β_i	= Vector of logistic regression coefficients.
X_i	= Vector of independent variables given as follows:
X_1	= Age (years)
X_2	= Sex (dummy)
X_3	= Education (literate = 1, otherwise, 0).

X_4 = Dependent (dummy).
X_5 = Daily income (1 = above \$1, 0 otherwise)
X_6 = Access to credit (yes=1, 0 otherwise)
X_7 = Marital status of the household head (married = 1, 0 otherwise)
X_8 = Access to sufficient food (1 = yes, 0 otherwise)
X_9 = Emp_stat, Employment Status of household head (1 = employed, 0 otherwise)
X_{10} = Household Accessibility to Land (1 = Access; 0 = No Access)

2.2 Ordinary Least Square (OLS) Multiple Regression Analysis

Ordinary Least Square (OLS) multiple regression analysis was used to determine the influence of urban agriculture on household income. The OLS model to be adopted in the study is as specified below:

$$Y_i = f(X_{is})$$

Where Y = dependent variables and X_{is} are the independent variables.

The explicit form of the model is presented in the equation below:

$$Yi = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \beta6X6 \, ei$$

Y_1 = total household income (₦)

The independent variables (X_{is}) include:

X_1 = urban farm income (₦)
X_2 = Non-farm income (₦)
X_3 = Farming experience (years)
X_4 = Age (years)
X_5 = Education (years)
X_6 = Household size (number)
e   = error term

2.2.1 Functional form specification

The relationship between the endogenous and each of the exogenous variables was examined using four (4) functional forms: linear, semi-log, Exponential and Double-log.

2.2.2 Linear

$$Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \beta6X6 + ei$$

Semi-log:

$$Y = \beta0 + \beta1 \, logX1 + \beta2 \, logX2 + \beta3 \, logX3 + \beta4 \, logX4 + \beta5 \, logX5 + \beta6 \, logX6 + ei$$

2.2.3 Exponential

$$Log \, Y = \beta0 + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \beta6X6 + ei$$

Double-log:

$$LogY = \beta0 + \beta1 \, logX1 + \beta2 \, logX2 + \beta3 \, logX3 + \beta4 \, logX4 + \beta5 \, logX5 + \beta6 \, logX6 + ei$$

The lead equation called the best linear unbiased estimate (BLUE) functional form was chosen based on econometric considerations such as magnitude of the independent variables, the coefficient of determination (R^2) and magnitude of the error term as well as statistical significance of the coefficient of independent variables.

3. RESULTS AND DISCUSSION

3.1 Socioeconomic Characteristics of the Respondents

Urban households are characterized with various socioeconomic factors. However, this study described the following socioeconomic variables; sex, age, marital status, household size, educational status, major occupation, and monthly income. These are presented in Table 1.

The dominance of male do not mean that the population of male in the area is more than that of female but there are more males heading their households compared to their female counterparts. This finding is a reflection of typical African traditional societies where the oldest male is designated as the head of household regardless of whether he is the primary source of economic support. The mean age identified in this study depicts an economically active age for the household heads and this could have implications on household participation in urban agriculture. This age provide them with the required energy to carry out various occupational activities for family welfare. Marriage implies decision to accept family responsibility such as provision of food, shelter and clothing. The high level of homogeneity in the distribution of household marital status in the study area can be attributed to similarities in cultural and religious practices.

Table 1. Distribution of respondents according to socioeconomic characteristics

Socioeconomic variables	Frequency	Percentage	Mean
A. Sex			
Male	148	61.7	
Female	92	38.3	
B. Age			
20 – 30	62	25.8	
31 – 40	42	17.5	
41 – 50	84	35.0	
51 – 60	40	16.7	
61 – 70	08	3.3	43 years
C. Marital status			
Single	12	5.0	
Married	216	90.0	
Widowed	08	3.3	
Widower	02	0.8	
Separated	02	0.8	
D. Household size			
1 – 5	92	38.3	
6 – 10	128	53.3	
11 – 15	16	6.7	
Above 15	04	1.7	7 members
E. Educational status			
Non-formal education (0 years)	22	9.2	
Primary education (1 – 6 years)	42	17.5	
Secondary education (7 – 12yrs)	136	56.7	
Tertiary education (Above 12)	40	16.7	11 years
F. Major occupation			
Civil Service	178	74.2	
Food Processing	04	1.7	
Farming	56	23.3	
Trading	02	0.8	
G. Monthly income			
50,000 and below	144	60.0	
51,000 – 100,000	88	36.7	
101,000 – 150,000	02	0.8	
151,000 – 200,000	04	1.7	
Above 200,000	02	0.8	₦53, 575

Source: Field survey, 2019, No. of Obs. = 240

The household size found in the study area is relatively large, which is typical of developing economy and this could mean more mouth to be fed by the household head with implications on participation in urban farming. Indicatively, the large size of household could positively influence household participation in urban agriculture. The level of education recorded in this study is not surprising as the respondents were all resident in urban/peri-urban areas. Educational status of respondents could increase or decrease participation in urban agriculture. Respondents with high level of education could be fully and gainfully employed in "white collar" jobs without participating in urban farming. Another possibility is the use of hired labour by this class of respondents without direct involvement in urban farming. On the average, one household earned ₦53, 575 in a month. It could be suffice to say that most of the sampled households in the study area are in the middle-income group. The income status could help in participation in urban farming.

3.2 Factors that Influence Household Participation in Urban Agriculture

Estimates of the binary logistic regression analysis on factors that influenced household participation in urban agriculture are presented in Table 2. The model's log likelihood ratio of 213.406 and χ2 value of 119.305 (P<0.01) indicate that all variables in the model jointly influenced the probability of household participation in urban agriculture at 1%. Furthermore, Pseudo R^2 (Nagelkerke R^2) of 0.522 implies that the variables included in the model accounted for 52.2% of the factors responsible for variations in the probability of household participation in urban agriculture. This means that, there are other factors apart from those captured in the model that could have affected the respondents' probability of participating in urban agriculture. These other factors are accounted for, by the remaining 47.8%.

The estimate of binary logit regression presented in Table 3 show that education, dependent, marital status, access to sufficient food, employment status and access to land significantly influenced household participation in urban agriculture. Hence, discussion will be based on these significant variables.

3.3 Education

The coefficient of education implies that, the probability of household participation in urban agriculture reduces with those who are literate. This finding could be attributed to the engagement of literate household heads in other jobs which may not avail them the time to participate or get involved in other activities such as urban agriculture. It should however be noted that, this outcome does not implies that respondents with different forms of education in the study area are not engaged in urban agriculture at all. This finding agrees with Dossa [7] when they reported that, involvement in urban agriculture is significantly and negatively associated with the level of formal education of the household head in Bobo Dioulasso, Burkina Faso.

3.4 Dependents

The probability of household participation in urban agriculture increases with households with dependents than households without. Dependent, a dummy variable used in this study is a proxy for household size. This finding did not come as a surprise as it is expected that, households with more mouths to feed and care for, should find some form of income augmenting activities such as participation in urban agriculture. This finding agrees with Jongwe [8] who reported that, an increase in the size of a household raises the household's vulnerability to food insecurity, thus, resulting in the household's participation in urban agriculture as a coping strategy.

3.5 Marital Status

The probability of household participation in urban agriculture increases with the married household heads than the unmarried.

Table 2. Estimates of the binary logistic regression showing factors that influence household participation in urban agriculture

Variable	Coefficient	t-value	Sig.
Age (years)	0.001	0.004	0.952
Sex (dummy)	-0.570	0.600	0.439
Education (dummy)	-0.862	4.255	0.003[***]
Dependent (dummy)	1.904	16.946	0.000[***]
Daily income (dummy)	0.177	0.060	0.806
Credit access (dummy)	0.603	0.158	0.691
Marital status (dummy)	2.544	2.494	0.014[**]
Access to sufficient food (dummy)	-2.495	4.411	0.000[***]
Employment status (dummy)	1.307	6.101	0.000[***]
Access to land (dummy)	0.505	10.458	0.000[***]
_Constant	3.979	11.033	0.000[***]

Source: Computed from field survey data, 2019; No. of Obs. = 240
Log-likelihood= 213.406, LR χ2 = 119.305, Prob>χ2 = 0.000; Pseudo R^2= 0.522
[***] and [**] = significant at 1% and 5% respectively

Table 3. Estimates of the linear OLS model of the effect of urban agriculture on household income

Variables	Coefficient	Standard error	t-value
_Constant	-2216.263	382.0056	-5.80[***]
Urban farm income (₦)	17.539	4.005	4.38[***]
Non-farm income (₦)	848.798	65.627	12.93[***]
Farming experience (years)	-0.019	0.163	-0.11[NS]
Age	-39.981	20.576	-1.94[NS]
Education (years)	13.020	10.262	1.27[NS]
Household size	164.518	87.378	1.88[NS]
R^2	0.7413		
F-value	108.41[***]		

Source: Computed from field survey data, 2019
[***], and [NS] = values significant @ 1% and not significant respectively

This outcome is also associated with dependents. The involvement of married respondents in farming activities could be a plus in agricultural production. This is evident as members of the household could help in labour supply. Mohammed [9] reported similar findings on drivers of poverty in Kogi State.

3.6 Access to Sufficient Food

The probability of household participation in urban agriculture decreases with households who had access to sufficient food than those who had not. The desire for food availability all year round and its sufficiency influences participation in urban agriculture among households in the study area.

3.7 Employment Status

The probability of household participation in urban agriculture increases with employed household head compared to their unemployed counterparts. This finding could be associated with the fact that, more often than not, income from urban farming serves as alternative income which supplements other income generating activities. This finding agrees with the reported of Jongwe [8].

3.8 Access to Land

The probability of household participation in urban agriculture increases with households who had access to land than household who had not. This result is in line with the *apriori* expectation. Considering the use of land for non agricultural purpose in urban areas, the issue of land scarcity for farming and other related activities is always

common. Participation in urban agriculture is therefore positively influenced when households have easy access to farm land.

3.9 Effect of Urban Agriculture on Household Income

The estimated Ordinary Least Square (OLS) regression model used to determine the effect of urban agriculture on household income are presented in Table 3. Output of the linear model was chosen for discussion based on certain econometric considerations.

From Table 3, the R^2 value was 0.7413 which implies that 74.13% of variation in household income was explained by the variables included in the model. The remaining 25.87% is attributed to error term. F-value of 108.41 which was significant at 1% implies that the model has a good fit to the data. Furthermore, variables such as urban farm income and non-farm income had significant effect on total household income.

3.10 Urban Farm Income (₦)

An increase in income from urban agricultural activities will increase total household income. Urban dwellers who are involved in urban agriculture have more food to feed the family and the excess could be sold as source of additional income. This finding agrees with Ibitoye [2] when they reported similar findings among urban farmers in Kogi State.

3.11 Non-Farm Income (₦)

Table 3 further shows that, an increase in income generated from non-farm activities will increase

the total household income, *all else equal*. This finding agrees with Korie [10] who reported that non-farm income and total household income were directly related and significant at 5%. Households are likely to engage in other employment that give them higher financial returns and pull them to diversify into those activities that generate more income for their livelihood.

4. CONCLUSION AND RECOMMENDA-TIONS

Empirical findings from this study showed that, urban agriculture is widely practiced in Kogi State. Participation was however influenced by farmers' socioeconomic characteristics such as education, dependent, marital status, access to sufficient food, employment status and access to land. The income obtained from urban farming had positive effect on households' total income. Undoubtedly, urban agriculture has the potential of improving the livelihood of urban dwellers. However, to ensure that the full potential of urban agriculture in improving urban livelihoods is realized, the following policy recommendations should be taken into consideration:

1. Access to land was a key driver of participation in urban agriculture. In view of this, urban agriculture should be integrated into land use planning of all urban centers in order to discourage encroachment of farm land. This can be achieved by establishing a green belt zone in urban areas.
2. Considering the potentials of urban agriculture, the State government should consider the integration of urban agriculture into urban development plans. This implies that urban agriculture should be established as a legitimate and viable economic activity in the State. Thus, there is the need for the development of institutional policies and legislative framework that would promote urban agriculture as a critical component of the development process.
3. There should be measures to ensure that urban farmers have access to necessary productive inputs. This will enable those involved to produce on large scale and also attract new people to engage in the activity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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