Urban Agriculture (UA) and Its Effects on Poverty Alleviation: A Case Study of Vegetable Farming in Ibadan Metropolis, Nigeria

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Abstract: Urban agriculture is a viable option to alleviate poverty among urban dwellers especially the unemployed and low income earners that barely cope with the expensive lifestyle of urban centers. Thus, this study investigated effects of urban agriculture on poverty alleviation among vegetable farmers. Specifically, described the socio-economic characteristics of vegetable farmers, examined profitability of vegetable enterprise, assessed level of poverty among vegetable farmers, and determined factors influencing level of poverty status of vegetable farmers. A multistage sampling procedure was used to obtain data from 100 respondents for the study. Data were collected on socio-economics characteristics such as age, marital status, educational level, household size, income level and expenditure level. Data were analyzed using descriptive analysis, budgetary analysis, Foster, Greer, and Thorbecke (FGT) index; and Probit regression analysis. Descriptive statistics for the entire respondents showed average values of 45(±8.10) years for age, 11(±4) years for years of experience, 7(±3.5) persons for household size, and 4(±3.5) hectares for farm size. The budgetary analysis showed that average net income, benefit-cost ratios and rate of return were ₦40, 327, ₦2.46 and ₦1.50, respectively. FGT index revealed that about 30% of the sampled vegetable farmers experience poverty. Only 3.4% experience extreme poverty, while 7.9% were moderately poor. Probit estimates further revealed that factors such as net income ($p<0.05$), cost of labour ($p<0.05$), and household size ($p<0.01$) had significant effects poverty status of vegetable farmers in the study area. However, the study concluded that vegetable enterprise is profitable and could help to reduce poverty to a minimum level. In accordance with the findings of the study, we therefore recommend that youths should be encouraged to go into vegetable farming as it was found to reduce poverty. Also, input support services in the form of credit facilities, fertilizer and other chemicals should be provided with a view to reduce cost of labour incurred on vegetable production.

Keywords: Poverty, Vegetable Farming, Urban Agriculture, Ibadan

1. Introduction

Poverty refers to a condition where basic needs such as food, clothing and shelter are not met. It can be classified into absolute and relative poverty. Absolute poverty is the condition where people cannot afford resources to support minimum level of physical health, while relative poverty refers to the condition where people do not enjoy certain standard level of living recommended by Government [1]. More than 70% of Nigerians live below the poverty line while 52.4% of urban dwellers live on a dollar per day [2].

This could suggest that about 52% of urban dwellers live in absolute poverty, while about 61.8% live in relative poverty. This was often ascribed to high rate of unemployment among people especially the youth who lack the opportunity of being employed [3]. Unemployment depletes the source of livelihood of people over time. However, eradication of poverty is to ensuring all Nigerians are provided with steady source of income and high purchasing power amongst others [4].

Urban agriculture (UA) remains the best policy strategy to raise the standard of living of urban poor through additional income earning [5, 6]. Studies [7, 8, 9] have differently shown that it could significantly contributes to farmers' means of livelihood thereby reducing severity of poverty in the urban areas. UA could generate income for the urban poor especially unemployed youth [10]. Firstly, it increases the quantity of food available to poor urban dwellers. Secondly, diversifying the diet of the poor through consumption of locally produced fresh and nutritious food. Also, this allows substantial savings through proximity production with limited packaging, transport and storage requirements. Lastly, it offers opportunities for productive employment in a sector with low barriers to entry [1]. It should be therefore, undertaken by urban poor to supplement their income in order to alleviate threatening poverty [11, 12]. UA was officially launched in Nigeria under the Federal Government's Operation Feed the Nation programme of 1976–80 to encourage urban residents to cultivate arable crops around their homes or on vacant land as supplementary source of income [13]. It has many different expressions, varying from backyard gardening to poultry farming to fish farming to vegetables farming. UA accounts for 80 percent of the vegetable supply in urban centers especially Ibadan metropolis. The specialization in vegetables gives urban farmers significant income for food and non-food expenses such as paying for school fees, household assets and health care service especially during the dry (lean) season when supplies decline and prices increase [14]. Irrigated urban vegetable production has been found to be financially and socially profitable [15].

Although vegetable production is a temporary venture, several studies [16, 17, 18, 19] have separately established the profitability of vegetable enterprise in various parts of the country. Profit could be viewed as an indicator of an enterprise to alleviating poverty and ensuring food security. Several scholars have investigated effects of UA on food security status in Nigeria [1, 7, 20, 21, 22, 23]. However, little attention was placed on its effects on the poverty status of farmers [24, 25]. Determining the effects of UA on poverty alleviation becomes imperative. Thus, this paper documents the effects of UA on poverty alleviation among vegetable farmers in Ibadan metropolis. Specifically, describes the socio-economic characteristics of vegetable farmers; examines profitability of vegetable enterprises; assesses the level of poverty among vegetable farmers; and determines the factors influencing poverty status of vegetable farmers.

2. Methodology

2.1. Study Area

The area of study is Ibadan city. Ibadan City has 11 Local Governments Area (LGAs); five LGAs within the metropolis and six LGAs at the periphery of the metropolis. The LGAs include Egbeda, Oluyole, Akinyele, Ona-ara, Lagelu, Ido, Ibadan North East, Ibadan North West, Ibadan South East, Ibadan South West and Ibadan North. Its population is about 2,550,593 (NPC, 2006). The population of Ibadan metropolis including LGAs is 1,338,659 according to the 2006 census results, covering an area of 128 km^2. Ibadan city has the highest urban vegetable supply in Southwestern Nigeria.

2.2. Sampling Procedure and Sample Size

A multistage sampling procedure was used to obtain data for the study. First stage involved purposive selection of Ibadan city based on commercialized and thriving urban agriculture practice in the city. Similarly, second stage involved purposive selection of the four LGAs in the metropolis where vegetable farming is mostly carried out. The third stage involved random selection of twenty-five vegetable farmers in each LGA making a total sample of 100 vegetables farmers for the study. Data were collected on socio-economics characteristics such as age, marital status, education level, household size, income level and expenditure level.

2.3. Analytical Technique

2.3.1. Descriptive Statistics

Descriptive statistics (frequency distribution, mean and percentage) was used to describe the socio-economic characteristics of vegetable farmers in the study area.

2.3.2. Budgetary Analysis

Budgetary technique was used to examine profitability of vegetable enterprise in the study area. It was calculated as follows:

$$GM = TR - TVC \qquad (1)$$

Where GM = Gross Margin, TR = Total Revenue and TVC = Total Variable Cost (cost incurred in the use of variable inputs)

Mathematically,

$$GM = \sum P_iQ_i - \sum R_iX_j \qquad (2)$$

Where GM = Gross margin of the farmers (Naira)
P_i is Price of ith crop in Naira;
Q_i is Total sales of ith crop in Naira;
R_i is Unit cost of variable input j used in producing ith crop in naira. The variable cost includes working capital (₦) cost of planting material (seed), fertilizer, chemicals, insecticides, water, cost per cropping season (family and hired labour) and other production inputs. Gross margin analysis is useful where the value of the fixed cost is negligible as it is the case with urban agriculture which is operated at small scale level

X_j is Quantity of variable input j used in ith selected size of crop.

i. Return on Investment (ROI)

This measures the profitability of an enterprise from current operations without regard to the interest charges on

the capital structure [26]. The formula is as follows:

$$ROI_i = \frac{Net\ Profit\ Margin_i}{Total\ Variable\ Cost_i} \qquad (3)$$

ii. Benefit-Cost Ratio (BCR)

This measures the rate of returns to the total cost incurred on production [27]. The formula is as follows:

$$BCR_i = \frac{Net\ Profit\ Margin_i}{Total\ Cost_i} \qquad (4)$$

2.3.3. Foster, Greer, and Thorbecke Poverty Index

The Foster, Greer, and Thorbecke (FGT) [27] weighted poverty index was used to assess level of poverty among vegetable farmers. The P-alpha measures poverty with respect to three different dimensions based indices FGT such as P_0, P_1, and P_2. P_0 measures the incidence of poverty, P_1 measures depth of poverty, while P_2 measures the severity of poverty. The three measures are all based on a single formula, but each index puts different weights on the degree to which a farmer falls below the poverty line. This measure is useful due to its decomposability among subgroups.

It was calculated as follows:

$$P_\alpha = \frac{1}{n} \int_o^z \frac{(z-x)\alpha}{z} \qquad (5)$$

Where:

Z is the poverty line

α represents the degree of aversion to poverty

n is the number of sampled farmers (i.e the number of vegetable farmers reached)

x is the household consumption expenditure of the farmers

When α =0, the FGT index is the standard head count ratio i.e. the share of farmers which are below the poverty line in the total population. This index does not measure the extent of poverty for the poor. When α =1, the index measures the poverty gap. This suggests the level of income required to bring all poor to the poverty line. This index does not capture inequality among the poor. It attaches same weight of a dollar of income gap for the extreme poor and those who are just under the poverty line. When α = 2, α addresses this issue. This index captures the inequalities i.e poverty severity.

2.3.4. Probit Regression Analysis

Probit regression model was used to determine factors influencing poverty status of vegetable farmers. Farmers were classified as poor or non-poor based on estimations of the poverty line to give a dummy variable with two categories; 1 defines farmers above poverty line, while 0 defines farmers below the poverty line. Then, the dummy variable was used as dependent variable for the probit regression analysis to estimate the coefficient of factors influencing poverty status of vegetable farmers. The explicit function is expressed as follows:

$$Y_i = \beta_0 + \beta_1\ GENFAM + \beta_2\ HHSIZE + \beta_3\ NTICM + \beta_4\ FAMEXP + \beta_5\ EDULEL + \beta_6\ COTLAB + \beta_7\ MEMBASS + e_i \qquad (6)$$

Y is poverty status (dummy variable; above poverty line =1, below poverty line =0);

The definition of explanatory variables included in model are:

GENFAM is Gender of farmer (dummy variable; 0 = female, 1 = male)

HHSIZE is Household size (number)

NTICM is Net income of farmer (₦)

FAMEXP is Farming experience (years)

EDUCLEL is Education level (years)

COTLAB is Cost of labour (₦)

MEMABASS is Membership of cooperative society (dummy variable; 0 = non-member, 1 = member)

3. Results and Discussion

3.1. Socio-economic Characteristics of Vegetable Farmers

Socio-economic characteristics of vegetable farmers were presented in Table 1. Majority (85%) of the respondents were male. This implies that vegetable production is mainly dominated by men in the study area. This could be attributed to the labour intensive nature of vegetable farming and the relative advantage men have over women in acquiring land based on some socio cultural norms. This conforms to the studies of [19, 25, 28]. The average age of vegetable farmers in the entire sample was 45 (±8.10) years. This implies that respondents were relatively young and economically active.

This follows the study of [28]. Majority (92%) of the farmers were married. This could indicate that the farmers have enough hands to work on the farm thereby reducing the production cost being incurred. The average farm size was 4 (±2.5) hectare for the entire sample of vegetable farmers. This implies that the farmers operate a subsistence vegetable enterprise which they offer for sale in local markets after meeting family needs. This could be ascribed to the limited access to land in Ibadan metropolis due to level of urbanization in the city. Therefore, farmers go to outskirt to farm then come back to the main areas to sell their products. Majority (88%) of the respondent had formal education. If completion of primary school is taken to be a sound literacy level, it can be deduced that the literacy level of the sampled farmers is relatively high. Similarly, majority (98%) of the farmers were majorly into vegetable production. This implies that famers are well educated and have access to information on vegetable production as a result ventured into vegetable enterprise. The average household size was 7 (±3.5) persons for the entire sample of vegetable farmers. This could indicate that household is the main supplier of labour available for agriculture in the study area. The average farming experience of the vegetable farmers in the entire sample was 11 (±4.0) years. This implies that the respondents have many years of farming experience. This reiterates the fact that quantum of experience could assert influence production and profitability of such enterprise [16, 28].

Table 1. *Socio-economic Characteristics of Vegetable farmers.*

Variables	Vegetable farmers
Male (%)	85
Age (years)	45 (8.10)
Married (%)	96
Farm size (ha)	4 (2.5)
Formal education (%)	88
Vegetable farming (%)	97
Household size (#)	7 (3.5)
Years of farming experience	11(4)

Note: Figures in parentheses are standard deviation

Source: Field survey, 2015

3.2. Budgetary Analysis

The distribution of the various costs incurred and returns to vegetable enterprise were presented in Table 2. This budgetary analysis was computed on twelve (12) months basis for farmers. The average total variable cost, the average total fixed cost, and average total cost were ₦19,794, ₦7,860, and ₦27,654 respectively. The average total revenue earned by sampled farmers was ₦67,981 at the end of the production period. The average gross margin realized to the enterprise and average net income earned by the farmers were ₦48,187 and ₦ 40,327 respectively. On the average, the net profit analysis showed that vegetable farmers were making profit. This implies that the farmers were able to cover all variable cost incurred in the course of production. The benefit cost ratio (BCR) analysis implies that ₦1.00 invested in the enterprise yielded ₦2.46. The other financial ratios also followed the same trend as benefit-cost ratio (BCR). The rate of returns analysis implies that every ₦1.00 invested by the vegetable farmers yielded ₦1.5 to the farmers. The Gross ratio implies that every ₦1.00 invested in the enterprise yielded ₦0.41to the farmers. This suggests that vegetable enterprise is profitable in the study area.

Table 2. *Budgetary analysis of vegetable enterprise.*

	Item	Mean Amount (₦)	% of cost structure
i.	Revenue (TR)	67,981	
ii.	Variable Costs		
	Cost of fertilizer	(3,307.2)	
	Cost of seed	(2,541.00)	
	Cost of labour	(9,875.00)	
	Cost of pesticide	(98.00)	
	Cost of Insecticide	(1,047.00)	
	Cost of transport	(2,806.00)	
	Other variable costs	(120.00)	
	Total Variable Cost (TVC)	*(19,794)*	100.00
	Gross Margin (TR – TVC)	48,187	
iii.	Fixed Costs		
	Cost of land rent	(5,084.00)	
	Cost of equipment	(27,76.00)	
	Total Fixed Cost (TFC)	*(7,860.00)*	100.00
	Total Cost (TC)=(TFC+TVC)	*(27,654.00)*	
	Net Farm Income(NI)=(TR–TC)	40,327.00	
	Performance and Financial Ratios		
	Profit Ratio (NI/TR)	0.59	
	Expense Structure Ratio (TFC/TVC)	0.39	
	Gross Ratio (TC/TR)	0.41	
	Benefit cost ratio (TR/TC)	2.46	
	Rate of return (NI/TC)	1.50	
	Ratio of TVC to TC (TVC/TC)	0.72	
	Ratio of TFC to TC (TFC/TC)	0.28	

Source: Data Analysis, 2015

3.3. Estimation of Poverty Line

The poverty line was calculated as two-third mean per capital household expenditure of the farmer's households. Farmers with a mean per capital household expenditure below this poverty line were classified as poor, while those above the mean per capital household expenditure were classified as non- poor. The results obtained from Foster Greer and Thorbecke of poverty level at different alpha level to test for the incidence, depth and severity were presented in Table 3. The poverty line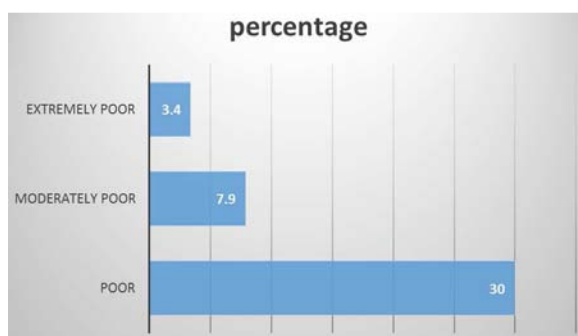 was observed to be 6567.053. The incidence, depth, and severity of poverty in the study were estimated to be 0.30, 0.079, and 0.034 respectively. This implies about 30% of the sampled vegetable farmers were affected by poverty. The result shows that urban vegetable farming has made an appreciable impact on poverty reduction among farmers in the study area. About 7.9% were moderately poor. Therefore, this set of vegetable farmers need more income to get above the poverty line. Just 3.4% experience extreme poverty as shown in Figure 1. This was often ascribed to the fact that labour costs is the highest component of total variable cost [16]. This implies that this

set of vegetable farmers spend much of their income on labour thereby reducing their net profit placing them in a vicious poverty circle.

***Table 3.** Foster, Greer and Thorbecke measures of poverty.*

Alpha level	Indices
Incidence ($\alpha=0$)	0.30
Depth ($\alpha=1$)	0.079
Severity ($\alpha=2$)	0.034

Source: field survey, 2015

Source: Field survey, 2015

***Figure 1.** Poverty level among vegetable farmers.*

3.4. Probit Estimates of Factors Influencing Poverty Status

Factors influencing poverty status of vegetable farmers were presented in Table 4. Log likelihood function and pseudo R^2 were -37.9 and 0.3658. The entire model was significant at one percent. This implies that the model is best fit. Out of the 7 explanatory variables included in the model, 3 were found to significantly influence the poverty status of vegetable farmers. The variables were household size ($p<0.01$), cost of labour ($p<0.05$) and net income accruing from vegetable farming ($p<0.05$). The coefficient of household size had a negative sign. This implies that an increase in household member by a person decreases probability of a farmer being poor. This can be attributed to the fact that households with large families may be forced to intensify farm activities in an attempt to earn more income in order to ease the consumption pressure imposed by a large family. Similarly, the coefficient of net farm income had a negative sign. This implies that increase in net farm income of the farmer help to reduce their poverty status. On other hand, the coefficient of cost of labour had a positive sign. This suggests that farmers' cost of operation increases the probability of a farmer being poor. This implies that much of farmers' income is used in paying labour required for vegetable farming therefore placing the farmers in vicious poverty circle.

***Table 4.** Probit estimates of factors influencing poverty status.*

Variable	Entire sample
Farming experience	0.0296(0.0301)
Household size	-0.5450(0.000)***
Education	0.0608(0.215)
Gender	0.3493(0.536)
Cooperative member	-4.4937(0.264)
Net farm income	-0.00602(0.035)**
Labor cost	0.0005(0.036)**
Constant	3.2953(0.000)***
Log likelihood	-37.97
Prob>chi2	0.000
Pseudo R^2	0.3658

*** Significant at 1%, ** Significant at 5%, * Significant at 10%. Figures in parentheses () are p-values.
Source: Field survey, 2015.

4. Conclusion

This paper investigated the effects of urban agriculture on poverty alleviation among vegetable farmers in Ibadan metropolis. A multistage sampling procedure was used to obtain data from 100 respondents for the study. The study concluded that vegetable farming is a profitable enterprise that could enhance the living conditions of farmers because it yields a very high return in a short period of time. Also, it could serve as supplementary income to farmers who do not engage mainly in vegetable farming. It is also gathered from the analysis of Foster, Greer and Thorbecke measures of poverty that majority (70%) of the farmers do not experience poverty because their income has been improved by engaging in vegetable farming. However, vegetable production despite being a means of supplementing income or main income stream, it is viewed from the study that some farmers are experiencing poverty because their production process is not sufficient enough to meet their family needs. The study employed a probit model to analyzes the determinants of poverty status among vegetable farmers. The estimates revealed that household size ($p<0.01$), net income ($p<0.05$), and cost of labour incurred in the farming operation ($p<0.05$) were critical determinants of poverty status of vegetable farmers in the study area. Following the findings of the study, it is recommended that youths should be encouraged to go into vegetables farming because it was found to alleviate poverty. Also, input support services in the form of credit facilities, fertilizer and chemicals should be provided with a view to reducing cost of labour incurred on vegetable production.

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