EFFECT OF POVERTY ON PRODUCTION EFFICIENCY OF VEGETABLE FARMING HOUSEHOLDS IN OGUN STATE, NIGERIA

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Abstract
In most Nigerian households, vegetables are consumed as a source of minerals and vitamins and in some case as substitutes to the more expensive animal protein. In spite of these economic potentials, in the Nigerian economy, most Vegetable Farming Households (VFH) are small scale producers. This study therefore examined the effect of resource use efficiency on poverty profile of VFHs in *Ogun* State, Nigeria. Data were obtained from randomly selected 160 VFH using a pre-tested questionnaire. The data were analysed by the use of Descriptive Statistics, Foster-Greer-Thobecke (FGT) index and Stochastic Frontier Analysis (SFA). Results revealed that majority (76.3%) of VFH heads were male, 74.4% had formal education, 89.4% were married and 36.9% were artisans. The average age of the VFH heads was 47 years and the mean monthly income was ₦20,200.00. FGT index estimate gave poverty incidence as 0.26 while poverty depth and severity were 0.37 and 0.009 respectively. The mean technical, allocative and economic efficiency of vegetable farming households were 62.3%, 68.9% and 43.2% respectively. SFA revealed that farm size, labour and fertilizer increased output ($p<0.05$) while (land) rent ($p<0.05$), fertilizer and agrochemical prices ($p<0.01$) as well as wages ($p<0.01$) increased costs in vegetable production. Furthermore; age, education, household size and poverty status ($p<0.01$) as well as farming experience, sex and household size ($p<0.05$) were the factors that reduced efficiency of VFHs. The implication from the findings of this study is that poverty reduction among the farming households led to reduction in farm efficiency. Therefore, apart from providing efficiency enhancing factors to farmers, stakeholders should (as a priority) implement a re-orientation programme that will make VFHs regard vegetable farming as a (business) investment in the study area.

Keywords: Vegetable, Farming household, Resources, Poverty, Efficiency.

Introduction

Vegetables are good sources of protein, mineral salts, sugars, vitamins and essential oils that increase man's resistance to diseases (Hugues and Philippe, 1995; Bakhru, 2003; Christian, 2006). They constitute between 30% and 50% of iron and vitamins A in resource poor diet (Christian, 2006). Leafy vegetables are an important feature of Nigerian's diet such that a traditional meal without it is assumed to be incomplete (Badmus and Yekini, 2011). In developing countries, such as Nigeria the consumption of vegetables is generally lower than the FAO recommendation of 75kg per year i.e. 206g per day *per capita* (Badmus and Yekini, 2011). AVRDC (2004) revealed that vegetables are the most affordable and accessible sources of micronutrients and its production is increasing in developing countries.

Kebede and Gan (1999) asserted that the main sources of farm income for small and limited resource farmers are basically arable crop production consisting of vegetable and non-vegetable crops. The popularity of vegetable is linked to the low cost per unit of resource use in the production, short gestation period and quick returns on invested capital compared to other crop enterprises (Udoh and Akpan, 2007). Vegetable (leafy and fruits) are widely cultivated in most parts of Sub-Saharan Africa (SSA). It is reported that the population in SSA is rising at about 2.5% - 2.8% which outstrips food production that is growing at about 1.5% - 1.6% (Ndoh and Akpan, 2007; Rosen and Shapouri, 2012; Ndagi, 2015). Nigeria is one of the countries (in SSA) where self-sufficiency in food production remains a critical challenge even in the absence of wars and natural disasters (ADB, 1999; Chauvin *et al*, 2012). A sustainable production of vegetables to meet the demands of an ever increasing population in the country has been an issue of great concern (Oladoja *et al.,* 2006; Badmus and Yekini, 2011). This is because the domestic demand for vegetables is met essentially from local production with importation of fresh vegetables into Nigeria been uncommon.

In Nigeria, the trend in vegetable production has shown an undulating pattern; for instance, in 2005 about 4,924.9 thousand tonnes were produced while 2,487.7 thousand tonnes were produced in 2006 (CBN, 2006; Ogunbo *et al.*, 2015). Mlozi (2003), Smith and Eyzayuirre (2007) asserted that increase in vegetable production improved food security and offered employment opportunities to many rural women in Nigeria. Vegetable production in Nigeria is characterized by use of crude implements, non-availability of inputs, illiteracy, expensive and complex technologies (Mofeke *et al.*, 2003; Ogunbo *et al.*, 2015). Consequently, vegetable production is constrained by inadequate infrastructure, agronomic and socio-economic variables (Sabo and Zira, 2009; Ogunbo *et al.*, 2015). The vegetable sub-sector of the Nigerian agricultural sector is however characterized by a large number of small-scale vegetable farmers, scattered over wide expanses of land with holdings ranging from 0.05 - 3.0 hectares per farmer, low capitalization and a low yield per hectare (Olayemi, 1994; Ogunbo *et al.*, 2015). The smallholder farmers have also been characterized by a low level of resource utilization, low levels of productivity, low returns to labour and a low level of capital investment (Olayide and Heady, 1982; Ogunbo *et al.*, 2015). In order to enhance the productive capacity of these important smallholders, concise information on the availability of aggregated farm level resources and differentials in productivities is essential. Therefore, the study of the efficiency level and the analysis of factors influencing efficiency to highlight the direction of resource use adjustment and allocation become pertinent. This is because increased production and productivity are direct consequences of efficiency of input combination given available technology (Ogundari and Ojo, 2005).

Efficiency is very important in that it is a first step in the process that might lead to substantial resource savings. These resource savings have important implications for both policy formulation and farm management. Also during financial stress, efficiency gains are particularly important because efficient farms are more likely to generate higher incomes and thus stand a better chance of surviving and prospering (Bravo-Ureta and Rieger, 1991); thereby escaping poverty.

Poverty is a plague that has persistently affected the world for long; especially the developing countries. About 1.4 billion of the world's people lived on $1.25 a day in 2005 (HDR, 2007/2008). In addition, the world's increase in rural and urban poor is exacerbated by the world's food and economic crisis which together with other factors make food unavailable to 1.02 billion people of the world (FAO, 2009; Ndagi, 2015). This, in absolute terms, increased the proportion of the world's poor (World Bank, 2010; Ayantoye *et al.*, 2011). In Nigeria, the incidence of poverty is on the increase with rural households being the worst hit (HDR, 2007/2008; Ayantoye *et al.*, 2011). UNDP (2009) reported that a whopping 70.8% of the Nigerian populace lived below $1.25/day benchmark in 2005. Poverty is also more pronounced in the agricultural sector than other sectors of the economy (FAO, 2009; Ayantoye *et al.*, 2011).

Poverty is likely to affect the capacity of the farm households to access better health and education facilities, purchase inputs at the proper time, acquire other farm assets and resources as well as adopt new technologies. The low level of these factors in turn affects agricultural productivity adversely. From these, poverty is not only an effect but also a cause of low agricultural productivity. Hence, the aim of this study is to examine the effect of poverty on the production efficiency of vegetable farming households in Ogun State, Nigeria.

Objectives of the Study

The broad objective of this study is to assess the influence of poverty on the production efficiency of vegetable farming households in *Ogun* State. The specific objectives are to:

1. determine the poverty status of vegetable farming households.
2. evaluate the production efficiency of vegetable farming household.
3. examine the effect of poverty on the production efficiency of vegetable farming households.

Methodology

The study was carried out in *Ogun* State of Nigeria which lies between latitudes 6^0N and 8^0N and longitude 2^0E and 5^0E. It is bounded partly by *Oyo* and *Osun* States in the North, Lagos State in the South, *Ondo* State in the East and the Republic of Benin in the West. It is situated within the tropics and derives its name from river "Ogun". The State, with over 70% of its land mass suitable for crop production, is approximately 1.9% (16,762 km^2) of Nigeria's 923,219km^2 land area (NBS, 2010). It has a tropical climate with rainforest vegetation on its southern part and a derived savannah on its northern end. The male population in *Ogun* State is 1,847,243 and female is 1,880,855 i.e. an overall population of 3,728,098 according to national population census 2006 (NPC, 2006; NBS, 2010).

Primary data obtained through a pre-tested questionnaire in interviewing selected respondent VHFs was used in this study. The questionnaire contained questions on socio-economic and socio-demographic characteristics of the respondents such as age, sex and farming experience of household head as well as household size, farm costs and returns. Multistage sampling technique was used to select one hundred and sixty (160) vegetable farming households for this study. At stage one, 50% of *Ogun* State Agricultural Development Programme (OGADEP) zones were randomly selected from the four OGADEP zones, which were *Abeokuta* and *Ilaro* zones. In stage two, four blocks were randomly selected from each of the selected zone while in stage three, four cells were randomly selected from the selected blocks. In stage four, five vegetable farming households were randomly selected from the cells; making a total of one hundred and sixty (160) respondents. The analytical tools used for this study were Descriptive Statistics, Foster-Greer-Thorbecke (FGT) Poverty Index, and Stochastic Frontier Analysis (SFA).

Descriptive Statistics: Tables of frequency, mean and percentage were used to describe the socio-economic characteristics of the respondents such as the age, marital status, educational level, sex and income of household head; household size and expenditure.

Foster-Greer-Thorbecke (FGT) Poverty Index: Poverty refers to the lower decile or quintile of the distribution of economic welfare (which is consumption expenditure per adult equivalent for this study). To profile the poverty level of the vegetable farming households, the FGT poverty index developed by Foster *et al* (1984) was adopted. The model is a class of additively decomposable measure of poverty. The measure entails the estimation of Poverty Incidence Index (PII), Poverty Gap Index (PGI) or Poverty Depth Index (PDI) and Poverty Severity Index (PSI). FGT provides a distributional sensitive measure through the choice of a poverty aversion parameter, "percent" (or α); the larger the value of α, the greater the weight given by the index to the depth and severity of poverty (Anyanwu, 1997).

The FGT measure for the i^{th} subgroup is given as:

$$P_{\alpha i} = \frac{1}{n}\sum_{j=1}^{q_i}\left(\frac{z-y_{ij}}{z}\right)^{\alpha} \quad \text{.......... (1)}$$

Where:
$P_{\alpha i}$= weighted poverty index for the i^{th} subgroup;
n = total number of households in the i^{th} subgroup (households in poverty);
y_{ij} = per adult expenditure of j^{th} household in i^{th} sub-group;
z = the relative poverty line;
q_i = the number of the sampled household population below the poverty line;
α = the aversion to poverty or degree of concern.
When α is equal to zero, it implies no concern and the equation gives head count ratio for the incidence of poverty (proportion of farming household that are poor).

$$P_0 = \frac{q}{n} \quad \text{.......... (2)}$$

When α is equal to 1, it shows uniform concern and the equation becomes:

$$P_{1i} = \frac{1}{n}\sum_{j=1}^{qi}\left(\frac{z-yij}{z}\right)^{1} \quad \text{.......... (3)}$$

This measures the depth of poverty (the proportion of expenditure shortfall from the poverty line) which Hall and Patrinos (2005) otherwise called the poverty gap. It is the average difference between the income of the poor and the poverty line.

When α is equal to 2, distinction is made between the poor and the poorest (Assadzadeh and Paul, 2003). The equation becomes:

$$P_{1i} = \frac{1}{n}\sum_{j=1}^{qi}\left(\frac{z-yij}{z}\right)^{2} \quad \text{.......... (4)}$$

The equation gives a distribution sensitive FGT index called the poverty severity index. It gives the extent of the distribution of expenditure paucity among the poor.

The poverty line used for this study is defined as two-thirds (⅔) of mean household expenditure per adult equivalent of the sampled population (FOS, 1999). Adult equivalent (AE) was generated following Nathan and Lawrence (2005) as follows:

$$AE = 1 + 0.7(N_1 – 1) + 0.5N_2 \quad .... (5)$$

Where:
AE = Adult Equivalent
N_1 = Adult of 18 years and above
N_2 = Children less than 18 years.

<u>Stochastic Frontier Analysis:</u> The econometric model specified for measuring technical inefficiency of vegetable farming households is the log-linear model derived from the Cobb-Douglas functional form of the Stochastic Frontier Functions. The explicit form of the stochastic production function is represented by equation (6).

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + V_i – U_i \quad ……....... (6)$$

Where:
Y_i = vegetable output of VFHs (kg);
X_1 = farm size (ha);
X_2 = seed (kg);
X_3 = fertilizer (kg);
X_4 = pesticides (litres);
X_5 = labour used (manday);
$\beta_0, \beta_1, …, \beta_5$ are estimated regression parameters;

V_i is the random variable assumed to be normally distributed i.e. $N(0, \sigma^2_V)$ and independent of U_i (a non-negative random variable), which is assumed to account for technical inefficiency in production.

The technical inefficiency is thus empirically measured by decomposing the deviation into a random component (U). In that case:

$$TE_i = Y_i/Y_i^* = \frac{exp(X_i\beta + V_i - U_i)}{exp(X_i\beta + V_i)} = \exp(-U_i) \quad ……..… (7)$$

Where:
Y_i = observed output
Y_i^* = frontier output.

Determinants of production inefficiency of smallholder vegetable farming households were examined as highlighted below:

$$Exp.(-U_i) = f(Z_1, Z_2, Z_3, ………, Z_6) \quad …..……………………………….......... (8)$$

Explicit form of the function:

$$Exp.(-U_i) = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + U \quad ..……............ (9)$$

Where:
Exp.($-U_i$) = production inefficiency of the i^{th} VFH;

Z_1 = age of household head (years);
Z_2 = level of education of household head (years);
Z_3 = farming experience of VFH's heads (year);
Z_4 = sex of VFH's heads (1 if male, 0 otherwise);
Z_5 = household size (number of persons);
Z_6 = poverty status of VFH (1 if non-poor, 0 otherwise);
Z_7 = extension contact (number of visit).

Stochastic Frontier (Cobb-Douglas) Cost Function was specified as follows:

$$\ln C_j = \alpha_o + \alpha_1 \ln P_{1j} + \alpha_2 \ln P_{2j} + \alpha_3 \ln P_{3j} + \alpha_4 \ln P_{4j} + \alpha_5 \ln P_{5j} + \alpha_6 \ln P_{6j} + V_j + U_j \text{ …....... (10)}$$

Where:
C_j = total production cost of j^{th} VFH (₦);
P_1 = land rent (₦),
P_2 = price of seeds per kg (₦);
P_3 = price of fertilizer per kg (₦);
P_4 = price of pesticide per litre (₦);
P_5 = wages (₦);
$\alpha_0, \alpha_1, ..., \alpha_6$ = vector of estimated parameters.

Determinants of cost inefficiency of smallholder vegetable farming households were examined as highlighted below:

$$\text{Exp.}(-U_j) = f(M_1, M_2, M_3, ………, M_6) \text{ …..…………………………………......... (11)}$$

Explicit form of the function:

$$\text{Exp.}(-U_j) = \delta_0 + \delta_1 M_1 + \delta_2 M_2 + \delta_3 M_3 + \delta_4 M_4 + \delta_5 M_5 + \delta_6 M_6 + U \text{ ..……........ (12)}$$

Where:

Exp.($-U_i$) = cost inefficiency of the j^{th} VFH;
M_1 = age of household head (years);
M_2 = level of education of household head (years);
M_3 = experience of VFH's heads (year);
M_4 = sex of VFH's head (1 if male, 0 otherwise);
M_5 = household size (number of persons);
M_6 = poverty status of VFH (1 if non-poor, 0 otherwise);
M_7 = extension contact (number of visit).

Following Farell (1957), an estimate of farm specific economic efficiency (EE) is obtained from technical (production) and allocative (cost) efficiencies as:

$$AE = \frac{EE}{TE} \text{ ………………..……….. (13)}$$

For an average farmer to achieve the same efficiency level as the most efficient farmer, the farmer will adopt a cost saving technique. This; in line with Parikh (1995), Udoh (2005) and Udoh and Etim (2009) is given as:

$$1 - \left(\frac{MEV}{HEV}\right)100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (14)$$

For the most inefficient farmer to achieve the same efficiency level as the most efficient farmer, the farmer will adopt a cost saving technique. This; in line with Parikh (1995), Udoh (2005) and Udoh and Etim (2009) is given as:

$$1 - \left(\frac{LEV}{HEV}\right)100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (15)$$

Where:
MEV = mean efficiency value,
LEV = lowest efficiency value,
HEV = highest efficiency value.

Results and Discussion

Table 1 presents the socio-demographic characteristics of vegetable farming households (VFHs) in terms of household head's age, sex, marital status and education as well as household size. The mean age of the heads of VFHs was 47 years; however, 92.9% of the heads were below 64 years of age. This implies that majority of the heads were still in their active age and (VFHs) are therefore expected to be productive given available resources. In terms of sex, 76.3% of the VFHs were headed by male while 23.8% were headed by females. This shows active involvement of men in vegetable production in the study area.

Furthermore, majority (89.4%) of heads of VFHs in the study area were married and the mean household size of VFHs was 7 persons. The implication of this is that in the traditional rural setting; a family is a good source of labour in food crop production. Table 1 further revealed that 74.4% of the sampled VFH heads in the study area had formal education whilst 25.61% had no formal education.

The distribution of secondary occupation, farming experience and secondary income of VFH heads as well as farm size of VFHs is presented in Table 2. In addition to farming as a main occupation, a sizable proportion (36.9%) of VHF's heads were artisans. The finding thus shows that production of vegetable is undertaken by people of diverse professions. Also, 28.1% of the VFH heads in the study area earned a monthly secondary income of between ₦21,000 to ₦30,000 with an average of ₦20,200/month. In terms of farming experience, the mean farming experience of VFH's heads was about 25 years. Majority (76.2%) of the VFHs in the study area had a farm size of 1.0 to 1.9 hectares with a 0.82ha mean farm size. A high proportion (98.1%) of VFHs' farm size falling below 3 hectares shows clearly the subsistence nature of farming in the study area.

The Foster-Greer-Thorbecke (FGT) analysis was used in determining the poverty status of vegetable farming households in the study area. Table 3 showed that the poverty incidence was 0.26 implying that 26% of the VFHs were poor. The poverty depth of the VFHs was 3.7%, implying that an average VFH fell short of escaping poverty by 3.7% of the estimated poverty line. That is, with a relative poverty line of ₦239.11 per day, what is required to get each (poor) VFH out of poverty is ₦8.85. The poverty severity of the vegetable farming households was 0.9%, indicating the few of the vegetable farming households belonged to the core poor.

The maximum-likelihood estimate (MLE) of the parameters in the stochastic frontier production is as presented in Table 4. The estimated variance (σ^2) is statistically significant ($p<0.05$) indicating goodness of fit and the correctness of the specified distribution assumptions of the composite error term. Gamma (γ) is estimated at 0.683 and is significant ($p<0.05$) indicating that 68.3% of the total variation in the output of vegetable among the sampled VFHs was due to the VFHs' technical inefficiency. Also, results of the production function showed that all the coefficients of input variables had *a priori* expected positive signs.

Farm size ($p<0.05$), fertilizer ($p<0.05$) and labour ($p<0.05$) were the factors influencing vegetable output of VFHs in the study area. Table 4 further showed that increasing farm size, fertilizer and labour would increase total production by 67.7%, 48.6% and 51.8% respectively. Furthermore, education, household size and poverty status ($p<0.01$) as well as age of VFH's head and farming experience of the head of VFH ($p<0.05$) were determinants of VFHs' (technical) efficiency. The coefficients of age and poverty status were positive and follow *a priori* expectation. The positive sign on age variable indicated that increasing age would lead to increase in technical inefficiency based on the fact that ageing farmers would be less energetic to work on the farm hence they would have low technical efficiency. The positive sign on poverty status indicates that non-poor VFHs had low technical efficiency. This implies that most VFHs still view farming as a (dirty) job for the poor; hence, households that are reasonably "well-off" will hardly treat vegetable cultivation like a business but as a subordinate venture useful only for subsistence. The coefficients of educational qualification, farming experience and household size were negative and follow *a priori* expectations. This means that VFH with large household size and educated heads with high farming experience were technically efficient. This finding thus confirms the fact that higher educational attainment motivates farmers to acquire and utilize innovations more effectively.

The maximum-likelihood estimates (MLE) of the parameters in the stochastic cost frontier model are presented in Table 5. The estimated variance (σ^2) is statistically significant ($p<0.01$) indicating goodness of fit and the correctness of the specified distribution assumptions of the composite error term. Gamma (γ) is estimated at 0.797 ($p<0.05$) indicating that 79.7% of the variation in VFHs' cost of production was due to cost inefficiency. The results of cost function showed that rent on land, price of fertilizer, price of pesticide and wage had *a priori* positive signs while price of seed had negative sign. Price of fertilizer ($p<0.01$), price of pesticide ($p<0.01$), wage ($p<0.01$) and rent on land ($p<0.01$) increased the (total) cost of production of VFHs by 56.8%, 61.6%, 43.4% and 23.6% respectively in the study area while price of seed ($p<0.01$) reduced (total) cost of production by 57.3%. This is because some VFHs were in the habit of using seeds from previous harvests in subsequent production seasons which is deleterious due to loss of vigour as a result of defects from in-breeding. Hence, leading to a compulsory expenditure on inputs such as fertilizer for increased yield. However, with the purchase of seeds from certified seed merchants, better yield is guaranteed with less use of other inputs such as fertiliser and this ultimately brings about a reduction in costs.

VFH head's age ($p<0.05$) is a variable that increased the cost inefficiency of VFHs i.e. advanced age would lead to low cost efficiency while poverty status ($p<0.01$) indicates that non-poor VFHs were cost inefficient. However, education ($p<0.01$) of VFH's head was a factor that reduced VFHs' cost inefficiency. Education gives a farmer the knowledge about how to combine inputs in an optimal manner and therefore reduce cost inefficiency. Furthermore, VFH's farming experience ($p<0.05$) and household size ($p<0.01$) were factors that reduced VFH's cost inefficiency. Experience is said to be the best teacher; hence, a farmer gains knowledge about how to combine inputs in an optimal manner over years of practising (vegetable) cultivation and therefore learn cost inefficiency reducing tactics with time. Also, with large household size, VFHs would be able to circumvent (perhaps) the most cost intensive factor of production i.e. labour (in peasant agriculture) through the use of family labour (which is often unremunerated) in vegetable cultivation.

VFH's production efficiency (PE) obtained using the estimated stochastic frontier is presented in Table 6. The predicted technical efficiency (TE) differs substantially among the VFHs as it ranges from 0.30 – 0.99 with a mean of 0.623. This means that if an average VFH in the sample was to achieve the TE level of the most efficient counterpart, then the VFH should adopt a 37.1% cost saving technique. Similarly, for the most technically inefficient VFH to achieve the TE level of the most efficient counterpart, then the VFH should adopt a 69.7% cost saving technique. The predicted allocative efficiency (AE) ranges from 0.30 – 0.99 with a mean of 0.689. This implies that if the average VFH in the sample was to achieve the AE level of the most efficient counterpart, the VFH should adopt a 30.4% cost saving technique. Similarly, for the most allocative inefficient VFH to achieve the AE level of the most efficient counterpart, then the VFH should adopt a 69.7% cost saving technique. The predicted economic efficiency (EE) also differs substantially as it ranges from 0.20 – 0.89 with a mean of 0.432. This means that if the average VFH in the sampled area was to reach the EE level of the most efficient counterpart, then the VFH should adopt 51.46% cost saving technique. Similarly, for the most economically inefficient VFH to achieve the EE level of the most efficient counterpart, then the VFH should adopt a 77.5% cost saving technique. The implication of these findings (TE, EE and AE) is that given the available production resources, the vegetable farming households (who are mainly smallholder resource poor VFHs), were fairly efficient in the use of their resources.

Conclusion and Recommendation

The findings of this study indicated that availability of labour, farm size and agrochemicals had profound effects on production efficiency while wages of labour, rent on land and price of agrochemicals exerted significant influence on the cost of vegetable production. Farmers' experience, age, education, household size and poverty status had significant contributions in production and cost inefficiencies. Hence, in conclusion, poverty reduction among the farming households resulted in decrease in farm efficiency. The less poor the VFHs, the lower their efficiency and this is attributable to the fact that majority (of farming households) in the study area were still in the long age mode of believe that agricultural production especially vegetable cultivation is a vocation for the poor. The households do not seem to regard vegetable farming as a business investment rather it is being treated as a subsistence venture. Therefore, stakeholders should make as priority a re-orientation programme for unlocking the business potential of vegetable farming in addition to the provision of efficiency enhancing factors (e.g. sound educational system, subsidized inputs and sustainable land tenure system).

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Table 1: Distribution of VFHs by socio-demographic characteristics

Variables	***Frequency***	***Percentage***	***Mean***
Age group (year)			
25 – 34	8	5.1	
35 – 44	54	33.8	
45 – 54	65	40.8	46.55
55 – 64	21	13.2	
≥65	12	7.5	
Total	***160***	***100***	
Sex			
Male	122	76.3	
Female	38	23.8	
Total	***160***	***100***	
Marital status			
Married	143	89.4	
Divorced	8	5.0	
Widowed	9	5.6	
Total	***160***	***100***	
Household size			
1 – 5	46	28.8	
6 – 10	87	54.5	7
11 – 15	27	17.0	
Total	***160***	***100***	
Education			
No formal	41	25.6	
Primary	68	42.5	
Secondary	40	25	
Tertiary	11	6.9	
Total	***160***	***100***	

Table 2: Distribution of VFHs by socio-economic characteristics

Variables	*Frequency*	*Percentage*	*Mean*
Secondary Occupation			
None	44	27.5	
Cassava Processing	39	24.4	
Artisanship	59	36.9	
Transport business	18	11.3	
Total	***160***	***100***	
Farming Experience			
≤10	5	3.0	24.79
11 – 20	52	32.5	
21 – 30	73	45.6	
31 – 40	27	17	
≥41	3	1.9	
Total	***160***	***100***	
Secondary Income (₦)			
≤10,000	44	27.5	
11,000 – 20,000	36	22.5	20,200
21,000 – 30,000	45	28.1	
31,000 – 40,000	32	20	
41,000 – 50,000	3	1.9	
Total	***160***	***100***	
Farm size (Hectare)			
0.1 – 0.9	24	15	
1 – 1.9	122	76.2	0.82
2 – 2.9	11	6.9	
>2.9	3	1.9	
Total	***160***	***100***	

Source: Field Survey, 2014

Table 3: Poverty profile of vegetable farming households

FGT Variable	**Poverty Index**	**Percentage**
Incidence (P_0)	0.26	-
Depth (P_1)	0.0373	-
Severity (P_2)	0.0087	-
Population below the poverty line (q)	41	25.63
Population above the poverty line (p)	119	74.38
Total population (n)	**160**	**100.00**

Table 4: Determinants of production efficiency of vegetable farming households

Variable	Coefficient	Standard Error	t-ratio	P-value
Constant	2.353***	0.468	5.02	0.000
Farm size	0.677**	0.297	2.28	0.023
Seed	0.020	0.014	1.43	0.153
Fertilizer	0.486**	0.179	2.70	0.000
Agrochemicals	0.339	0.297	1.14	0.255
Labour	0.518**	0.202	2.57	0.010
Inefficiency Model				
Constant	1.177**	0.468	2.51	0.012
Age	0.522**	0.195	2.68	0.009
Education	-0.683***	0.228	-3.00	0.000
Farming experience	-0.454**	0.216	-2.10	0.020
Sex	-0.582	0.316	1.84	0.066
Household size	-0.281***	0.059	-4.75	0.000
Extension contact	-0.339	0.764	-0.44	0.657
Poverty Status	0.768***	0.237	3.24	0.000
Sigma–square	0.525**	0.183	2.88	0.012
Gamma	0.683**	0.250	2.73	0.014
Log likelihood	43.7			

***Estimates are significant at 5% α-level. *** Estimates are significant at 1% α-level.*

Table 5: Determinants of cost efficiency of vegetable farming households

Variable	Coefficient	Standard error	T-ratio	P-value
Constant	0.381***	0.075	5.08	0.000
Rent on land	0.236**	0.112	2.11	0.035
Price of Seed	-0.573***	0.030	-19.03	0.000
Price of Fertilizer	0.568***	0.034	16.55	0.000
Price of Agrochemicals	0.616***	0.058	10.69	0.000
Wage	0.434***	0.012	36.77	0.000
Inefficiency model				
Constant	2.089***	0.689	3.03	0.000
Age	0.655***	0.179	3.65	0.000
Education	-0.482***	0.105	-4.59	0.000
Farming experience	-0.389**	0.154	-2.53	0.012
Sex	-0.162	0.119	-1.36	0.068
Household size	-0.557***	0.095	-5.86	0.000
Extension contact	-0.249	0.150	1.66	0.064
Poverty Status	0.627***	0.195	3.21	0.000
Sigma-square	0.645***	0.097	6.65	0.000
Gamma	0.797**	0.268	2.97	0.012
Log likelihood function	36.8			

Estimates are significant at 5% α-level; * Estimates are significant at 1% α-level

Table 6: Distribution of Respondents by Efficiency in Vegetable Production

Efficiency level	Technical Efficiency		Allocative Efficiency		Economic Efficiency	
	Freq.	(%)	Freq.	(%)	Freq.	(%)
0.20 - 0.29	-	-	-	-	35.0	21.9
0.30 - 0.39	9	5.6	2	1.3	41.0	25.6
0.40 - 0.49	30	18.8	24	15.0	30.0	18.8
0.50 - 0.59	44	27.5	27	16.9	23.0	14.4
0.60 - 0.69	27	16.8	35	21.9	19.0	11.9
0.70 - 0.79	20	12.5	33	20.6	8.0	5.0
0.80 - 0.89	16	10.0	19	11.9	4.0	2.5
0.90 - 0.99	14	8.8	20	12.5	-	-
Total	**180**	**100.0**	**180**	**100.0**	**180**	**100.0**
Mean	0.623		0.689		0.432	
Std dev.	0.168		0.159		0.165	
Minimum	0.35		0.37		0.20	
Maximum	0.99		0.99		0.89	