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Resources use Efficiency among Urban Vegetable Farmers in Ogbomoso Agricultural Zone Area of Oyo State, Nigeria

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Abstract - Vegetables are important for both domestic and export markets and almost all households in Nigeria include vegetables in their diets. The study examined the resources use efficiency among urban vegetable farmers in the Ogbomoso Agricultural Zone Area of Oyo State, Nigeria. A multistage sampling technique was adopted to select 80 respondents who were interviewed with the aid of a structured questionnaire. The data were analyzed using both descriptive and inferential statistics (regression analysis).

The result showed that 32.5% of the respondents were between the age ranges of 31- 40 years with the mean age of 44 years, 53.7% of the respondent were married, 70.0% of the respondents had a household size between 5-8 household members with the mean household size of 9 members. 51.3% of the respondents had secondary education, 51.3% of the respondents had between 11-20 years in vegetable production, 77.5% had less or equal to 0.5ha farm size with the mean farm size of 0.65ha, 73.7% of the respondents did not have any visit by extension agent, 83.8% of the respondents had access to credit, 85.0% of the respondent got their land through renting. The result of the regression analysis showed that age and labor were negatively significant at 1% level and negatively affect the output of the vegetable in the study area, household size, years of schooling, farm size, and seeds were positively significant at 1% level and positively affecting the output of vegetable in the study area, the farming experience was positively significant at 5% level and positively affecting the output of the vegetable production in the study area while access to credit was negatively significant at 5% level and negatively affecting the output of the vegetable production in the study area

In conclusion, age, access to credit and labor had a negative effect on the output of vegetables in the study area, hence the labor-saving technologies and credit facilities are made available to the farmers.

Keywords - *Resource use, Efficiency, Vegetable production, Urbanization.*

I. INTRODUCTION

Agriculture is the mainstay of the Nigerian economy, it accounts for over 70% of the active labor force and more than 23% of the Gross Domestic Product in Nigeria. Majority of rural poor invest in agriculture especially in the production of major food crops such as tubers (yams and cassava), legumes (groundnut and cowpea), vegetables as well as cereals (sorghum, maize, and rice) (World Bank, 2017). Urbanization has led to an increasing loss of agricultural land, thus reducing the agricultural growth rate in Nigeria. Urbanization of some places presents both challenges and opportunities for the developing countries as a whole. There is an indication that the challenges of urbanization outweigh its opportunities in these regions. This may be because urbanization has not yet been matched with infrastructural and economic development. This in turn leads to urban poverty and food insecurity, (Drescher *et al.*, 2001). Urban Agriculture (UA) which is the growing of crops and raising of animals within and around cities (Drescher *et al.*, 2001), has emerged as a strategic imperative for developing countries and is one of the strategies people use to reduce poverty and food insecurity. Agricultural activities within city limits have existed since the first urban populations were established thousands of years ago (Drescher, 2002).

However, it is only recently that UA became a special focus of research and development attention, as its scale and importance in an urbanizing world become increasingly recognized (Nugent, 2000). This is essentially due to its potential for poverty reduction, economic empowerment, and household food security. It is estimated that 800 million people are engaged in urban agriculture worldwide of which 200 million are considered to be market producers, employing 150 million people full-time (FAO, 2018). These urban farmers produce a

substantial amount of food for urban consumers. Among the various foods, the production and consumption of vegetables arc very importantly because of their contribution to good health and as cheap sources of minerals and vitamins needed to supplement people's diet which is mainly carbohydrates, (Anim *et al.*, 2015).

Vegetables are important for both domestic and export markets. Almost all households in Nigeria include vegetables in their diets. Nutritionally, vegetables are good sources of vitamins, protein minerals, and fiber. For those in the producing areas, vegetable production is a major H source of income for farmers in time past the production of vegetables was largely subsistence, B with a major portion of the produce consumed by the farm household. Due to an increase in demand for dry season vegetables, however, producers now see vegetable production as a business and produce all year round.

According to Loughrey *et al.*, (2013), raising agricultural productivity involves making an investment in the land itself. However, according to Nurah (1999), farm operators are not able to make much investment unless they are sure of the returns of their efforts and expenses they put into improving the land. In most countries, it has not been possible to increase production as land for cultivation is becoming effectively scarce. Land-use changes impact the quality and availability of soils, water, and biodiversity (Awoke and Okorji, 2000). In most developing countries where there is land scarcity, it has not been possible to increase the scale of operation of vegetable production this has led to shrinkage of land available for agriculture. This is further exacerbated by the loss of farmland due to land degradation. This leads to increasing demand for agricultural land, which usually ends up in converting more forest land into farmland/grazing land.

Nurah (1999) reported that commercial vegetable production is quite labor demanding and that many farmers will rely on family labor if the farm size is small. Most farmers, therefore, hire labor to supplement their own family labor supply. Labour is the major factor of production in the traditional farming systems of West Africa and as such the utilization and productivity of labor is a key element in increasing the agricultural output and incomes of small farmers. To an extent that there is underemployment of labor in Agriculture, the potential exists for increasing output, employment, and incomes. According to Nurah (1999), vegetable production is capital intensive; equipment is needed to till the land, irrigate the crops, apply crop protection chemicals, and process the harvested products. Arsanti and Bohme (2007) indicated the varied sources of acquiring capital for farming were obtained from savings, gifts, and inheritance, outside equity capital, leasing, contract production, and borrowing. Food is needed all the time, so fresh clean water is also needed to produce our food. With the growing demand for food and climate change, on the other hand, many regions especially in Africa struggle to find enough freshwater to meet their needs. In some parts, pollution from pesticides and fertilizers used in agriculture alone remains a major cause of poor water quality (Ash, 2011). According to Frank and Roland (2013), increasing water use efficiency should be one of the goals of vegetable producers. Vegetable crops require more total water and more frequent irrigation than most agronomic crops. Vegetable water requirements vary from each growing season, depending on the kind of vegetable is grown, production location, and environmental conditions. Water use efficiency can also be increased through effective application scheduling.

Mussa *et al.*, (2011) stated agricultural productivity depended on how factors were efficiently used in the production process. Therefore the intensification of agricultural land and expansion of technology use must be accompanied by resource use efficiency that helps the productivity of factors. Improvements in resource use efficiency hence increase in productivity will reduce encroachment of population to marginal agricultural lands. In turn, this will protect the resource base of the poor against degradation. More importantly, efficient resource use is the basis for achieving universal food security and poverty reduction strategies, particularly in rural areas. It is also crucial for policymakers to have adequate and evidence-based policy options to increase efficiency and productivity to improve the livelihoods of the poor. Al-Said et al. (2012) stated that improving land and water productivity can make a sterling contribution to global food production and poverty alleviation. Groundwater has always been a critical resource for agriculture. Land and water productivity can help address water scarcity concerns through more productive use of scarce land and water resources and higher socio-economic benefits from available land and water resources.

Umoh (2006) stated that the question of efficiency in resource allocation in traditional agriculture is not trivial. It is widely held that efficiency is at the heart of agricultural production. This is because the scope of agricultural production can be expanded and sustained by farmers through the efficient use of resources. Efficiency has remained an important subject of empirical investigation particularly in developing economies where the majority of the farmers are resource-poor. Increasing population and wealth are resulting in rising pressure on key resources to satisfy growing demand. The physical, economic, and geopolitical accessibility of resources and the efficiency and sustainability of their use are of paramount concern worldwide (Van den, 2011). Vegetable farming systems differ significantly from one area to another (Arsanti and Bohme, 2007).

The question of efficiency in resource allocation in traditional agriculture is crucial. It is

widely held that efficiency is at the center of agricultural production. This is because the scope of agricultural production can be expanded and sustained by farmers through the efficient use of resources. Therefore efficiency has remained an important subject of empirical investigation particularly in developing economies where the majority of the farmers are resource-poor (Umoh 2006). The efficiency of vegetable production is very crucial in determining the returns on investment. Quite often the introduction of new technology has been used as a standard for distinguishing between a modern system and a traditional system, and for improving the efficiency of the production system. However, in the developing world, some new technologies have been barely successful in improving production efficiency. This has often been blamed on the lack of ability and /or willingness on the part of producers to adjust input levels because of their familiarity with traditional agricultural systems and or the presence of institutional constraints (Amodu *et al.*, 2011).

The reasons for this are unknown yet, but the production of vegetables is becoming less each year. Farmers produce different crops throughout the year for crop rotation but are still barely making a profit and barely improving their living standards. This study assumes that limited resource mobilization and allocation is the main reason affecting vegetable productivity in Ogbomoso agricultural zone. Therefore the study is aimed at investigating the resource use efficiency among urban vegetable farmers in the Ogbomoso ADP zone of Oyo state.

II. METHODOLOGY

The study was carried out in the Ogbomoso Zone of ADP in Oyo State. Ogbomoso zone was made of 5 Local Government Areas namely; Orire, Ogo-Oluwa, Surulere, Ogbomoso North, and Ogbomoso South. Ogbomoso was located approximately on Longitude $4^0$15' East of Greenwich and on latitude $8^0$7' North of the equator. The town was situated 104 kilometers North of Ibadan Oyo State capital, 51 kilometers South-West of Ilorin Kwara State capital, 53 kilometers North-West of Oyo town, and 98 Kilometers North-East Osogbo capital of Osun State. The population of this study comprises all vegetable farmers in the study area. The village listing survey in Oyo State (OYSADEP, 2001) with a multi-stage random sampling technique was used in selecting the respondents for the study. The first stage involved the purposive selection of the Ogbomoso North and Ogbomoso South because they are the urban centers in the Ogbomoso ADP zone. The second stage involved the random selection of the respondents in the selected LGA making a total of 80 households as respondents for the $_{study}$. Data was collected with the use of a structured questionnaire and analyzed with descriptive statistics; frequency table and percentages on socio-economic characteristics of households in the study area.

A Linear regression analysis involving the use of the Ordinary Least Square (OLS) estimation technique was used to determine the effect of socio-economic variables on the urban fanner's vegetable output. The implicit form of the regression model is as shown:

$Y=f(Xi,X_2, X_3,X_4,X_5, X_6,X_7,X_8,X_9,U)$...(implicit form).....(1)

Where Y = Output of waterleaf (kg)
X_1= Quantity of seed (kg)
X_2 = Labour (in man-days)
X_3 = Manure/organic waste (kg)
X_4 = Land size (in hectares)
X_5 = Farming experience (in years)
X_6= Age of farmers (in years)
X_7= Educational level (years of formal schooling)
X_8= Household size (number)
X_9= Frequency

A. Ordinary Linear form

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 ... b_nX_n + U$$

Where b_0, b_1-b_n are estimated coefficients, X_1-X_n are defined, economic statistical and econometric criteria were employed to choose the lead equation based on R^2 estimates and the standard error values as well as consistency with a priori expectations. The efficiency of resources used in urban vegetable production was determined as follows: r = Marginal Value Product/Marginal factor cost = MVP/MFC Where

MVP = Product of marginal physical product and unit price of output

MFC = Cost of one unit of a particular resources

r = Efficiency ratio

If, r = 1, it implies that urban farmers are efficient in the use of the particular resource.

r< 1, implies that urban farmers are inefficient (underutilizing resources) in resource use.

r> 1, implies that urban farmers are inefficient (over-utilizing resources).

B. The elasticity of production (Bp)

The elasticity of production is a concept that measures the degree of responsiveness of output for a given unit change in the inputs. Ep=b.X

Where b= coefficient of individual inputs x = means of input y = means of output.

III. RESULT AND DISCUSSION

A. Socio-Economic Characteristics of Respondents

The result in table 1 revealed that 31.3%, 32.5% 21.2%, and 15.0% of the respondents were within the age range of less or equal to 30 years, 31-40 years, 41-50 years, and greater than 50 years of age with the mean age of 48 years. Also, 16.3% and 83.7% of the respondents were male and female respectively, 25.0%, 53.7%, 6.3%, 3.7%, and 11.3% of the respondents were single, married, divorced, widowed, and separated, 13.7%, 51.3%, 7.5 and 27.5% of the respondents had educational level from

primary, secondary, tertiary and adult education respectively, 6.3%, 51.3% and 42.4% of the respondents had farming experience between less or equal to years, 11-20 years and greater than 20 years, 15.0%, 70.0% and 15% of the respondents had the household size of less or equal to 4 household members, 5-8 household members and greater than 8 household members with the mean household size of 6 members. The result shows that 77.5%, 17.5%, and 5.0% of the respondent had less or equal to 0.5, 0.6-1 and greater than 1 hectare of farmland, 85.0%, 43.85, and 22.5% of the respondents acquired their land through rented, inheritance and purchased, 83.8% and 16.2% of the respondents do not have and had access to credit respectively, 73.7% and 26.3% of the respondents do not have and had access to extension agent respectively, 46.3%, 40.0% and 13.7 of the respondents plant greater than 10kg, 6-10kg and less than 5kg of vegetable seeds also 92.5%, 42.5%, 22.5% and 10.0% of the respondents watered their vegetable through the use of streams, dugouts, lakes, and wells respectively.

Table 1. Socio-Economic Characteristics of Respondents

Socio-economic Characteristics	Frequency	Percentages
Age		
≤30	25	31.3
31-40	26	32.5
41-50	17	21.2
>50	12	15.0
Sex		
Male	13	16.3
Female	67	83.7
Marital Status		
Single	20	25.0
Married	43	53.7
Divorced	5	6.3
Widowed	3	3.7
Separated	9	11.3
Educational Level		
Primary education	11	13.7
Secondary education	41	51.3
Tertiary education	6	7.5
Adult education	22	27.5
Farming Experience		
≤10	5	6.3
11-20	41	51.3
>20	34	42.4
Household Size		
≤4	12	15.0
5-8	56	70.0
>8	12	15.0
Farm Size		
≤0.5	62	77.5
0.6-1	14	17.5
>1	4	5.0
Land Ownership* **		
Rented	68	85.0
Inheritance	35	43.8
Purchased	18	22.5
Access to Credit		
Yes	13	16.2
No	67	83.8
Extension Visit		
Yes	21	26.3
No	59	73.7
Quantity of Seed planted		
≤5	11	13.7
6-10	32	40.0
>10	37	46.3
Sources of water* **		
Stream	74	92.5
Lake	18	22.5
Well	8	10.0
Dugout	34	42.5

Source: Field Survey, 2018.

B. Resource use Efficiency

The value of the MPP in table 2 showed that the farmers were efficient in the use of the seed, more efficient in the use of pesticides, and most efficient in the use of land. This suggests that if additional units of seeds, pesticides, and land were available and accessible, it would lead to an increase in the vegetable yield by 114.58, 322.64, and 568 kg among the farmers respectively. This implies that the farmers were technically efficient in the use of pesticides and most technically efficient in the use of land, of all the resources used, herbicides, fertilizers, and labor had the least MPP (-617.76, 0.07, and 2.08 kg respectively). This showed inefficiency in the use of herbicides, fertilizers, and labor gave the level of technology and the price of both inputs. A resource is said to be optimally allocated if there is no significant difference between the MVP and MFC that is, the ratio of MVP to MFC was greater than unity (1), for seed, pesticides, and land. This implies that seed, land, and pesticide were under-utilized while herbicides, fertilizer, land, and labor were over-utilized (less than one). This means that vegetable output was likely (seed, land, and pesticides) had been used. The adjustment in the MVP for optimal resource use (divergence) in Table 2 indicates that for optimum allocation resource more than 97% increase in speed was required, while approximately 91% and increase in land and pesticides respectively, herbicides, fertilizer, and labor were over-utilized and required approximately 103.51% and 4.2% reduction respectively for optimal use in vegetable production.

Table 2. Values of Estimates of Efficiency Parameter

RESOURCE	APP	MPP	MVP	MFC	MVP/MFC	EFFICIENCY	DIVERGENCE GAP
Seed	481.24	114.58	4232.59	88.06	48.05	4,44.53	97.92
Land	1213.62	568.72	21008.52	2000	10.50	19008.52	90.48
Herbicide	1900.78	617.75	22819.69	800	-28.53	-23619.69	103.518
Pesticide	1265.56	322.64	11918.32	1200	9.93	10718.32	89.93
Fertilizer	0.08	0.01	0.41	110	0.004	-109.59	-267.29
Labour	45.21	2.08	76.84	400	0.19	-323.16	-4.21

Source: Computed from STATA 14, 2018.

C. Effects of Socio-Economic Variables on Urban Vegetable Farmers' Output

A regression model was used to estimate the effect of socio-economic variables on urban vegetable farmers' output. The results of the analysis showed that R^2 value of 0.862 is the level of significance of the coefficient of the explanatory variables and their signs (Table 3), which implies that 86.2% of the variation in the revenue of the vegetable farmers in the study area is explained by the variable listed in Table 3. Age was negatively significant in relationship with output at 1% level, implies that as the farmer is growing old they may not be unable to work more on their farm and they may tend to be more risk-averse, with regards to the adoption of innovations that would enhance their productivity. On the other hand, household size was positively significant at a 5% level which implies that an increase in household size will lead to an increase in the profit of the vegetable framer in that it will reduce the cost of hiring labor in which most (farmers) are making use of family labor. Similarly, education was positively significant at a 1% level, which implies that a higher level of education enables farmers to acquire and process relevant information more effectively. It also equips them with better managerial skills which eventually lead to improved methods of production and hence higher level output. The farming experience was positively significant in relationship with output at 5% level, which implies that more experienced farmers were more productive in the vegetable farming in that they may be more knowledgeable in the production system and may therefore be better able to access and manage the risks involved in the system than inexperienced farmers. Access to credit was negatively significant at the 5% level, this may be as a result of the percentage of the farmer that had access to credit in the study area and it may hinder their production because they may not be able to acquire new seeds, production techniques, etc.

The coefficient of labor was positively significant at the 1% level. Labour as a factor of production is generally of overwhelming importance and makes up about 92% of the costs of production in many African farming systems. The efficiency ratio for labor was 0.94, which suggests that the farmers were over-utilizing this resource. Quantity of planting seed was positively significant in relationship with output at a 1% level, which implies that an increase in the kilogram of seed planting will increase the profit of the farmers in the study area.

The calculated elasticities of production with respect to all the variable inputs were less than one. This implies that the individual inputs were inelastic, indicating decreasing returns to the various inputs. The sum of the elasticity of production reflects the nature of a return to scale. This measures the response of the output to a one percent change in all the inputs. The sum amounted to about 0.9318, implying that if all inputs were increased by one percent, the output would increase by less than one percent. In order words, the production of vegetables in the area is said to be characterized by decreasing returns to scale.

Table 3. Effect of Socio-Economic Variables on Urban Vegetable Farmers' Output

Variable	Coefficient	Std. Error	T-ratio
Constant	1.9527	0.2547	7.67
Age	-0.3632	0.1320	-2.75*
Sex	-0.0981	0.0721	-1.36
Marital Status	1.2402	1.5113	0.82
Household Size	0.9735	0.3618	2.69*
Years of Schooling	0.0555	0.0141	3.94*
Farming Experience	0. 7240	0. 3314	2.18**
Membership of Association	0.3700	0.7403	0.50
Credit Access	-0.9304*	0.4172	-2.23**
Farm Size	0.3252	0.1149	2.83*
Labour	-0.8190	0.2354	-3.48*
Seeds	0.5492	0.0620	8.86*
Manure	-0.0294	0.0261	1.13
Frequency of of harvest	0.3752	0.3118	1.20

Source: Computed from STATA14, 2018.

$R^2 = 0.862$

Adjusted $R^2 = 0.790$ * Significant at 5% level ** Significant at 5%

IV. CONCLUSION AND RECOMMENDATION

The output of vegetables in the study area was positively and significantly influenced by the farmers' household size, years of schooling, farming experience, farm size, and quantity of seed planted while age, access to credit, and labor were negatively affecting the outputs of vegetable production in the study area. The efficiency analysis indicates underutilization of land and manure and overuse of labor. Labour accounted for the highest cost of production while lack of credit access was the major constraint facing the farmers. It is therefore recommended that labor-saving technologies and credit facilities be made available to the farmers.

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