

FACTORS THAT INFLUENCE TOTAL FACTOR PRODUCTIVITY OF UPLAND VEGETABLE FARMERS IN ORUK ANAM LOCAL GOVERNMENT AREA OF AKWA IBOM STATE, NIGERIA

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Abstract

In Nigeria, fluted pumpkin is widely cultivated for its palatable and nutritious leaves which is a good source of protein, mineral salts, sugars, vitamins, and essential oils that increase man's resistance to disease. Its production also constitutes a reliable source of livelihood activity among resource poor farmers. Based on these enormous advantages of leafy vegetable production, this study examined factors affecting the total factor productivity among fluted pumpkin farmers in Oruk Anam Local Government Area, Akwa Ibom State, Nigeria. Primary data were collected from 100 upland fluted pumpkin farmers using well-structured questionnaire and was complemented by personal interview and observation to ensure accuracy and consistency of data collected. Data were analyzed using descriptive statistics and Ordinary Least Squares regression analysis. The finding showed that, total factor productivity among respondent averaged at 60.10 units, implying that most vegetable farms in the study are efficient in resource management. The empirical results for determinants of total factor productivity indicate that education, social capital formation, farming experience, agricultural extension visit, farm income, gender and farm size have positive relationships with the total factor productivity of fluted pumpkin farmers in the study area. Alternatively, household size has negative coefficient and was statistically significant at conventional probability level. To increase TFP among vegetable farmers in the State, the study recommends expanded adult education programme and formation of social groups among vegetable farmers. Government should improve extension services and supports farm input subsidies to vegetable farmers in the region.

Keywords: Farmers, Productivity, Fluted Pumpkin, Farm Resource, Upland, Akwa Ibom State

Introduction

Farm resource productivity is a vital issue for agricultural development, policy formulation and self-food sufficiency drive of developing countries. Also, the relative efficiency of resource use among resource poor, peasant and traditional based rural farmers has been a subject of theoretical and empirical interest in developing countries (Omonona *et al.*, 2010 and Niragira, 2011). Meanwhile, agricultural sector has continue to be a primary instrument for sustainable development, poverty reduction, job creation, attainment of household self-food sufficiency and food security in most developing countries in Africa (Olwande *et al.*, 2009). For instance, Nigeria's economy despite of being driven predominantly by crude exploration and exportation is mostly considered as an agrarian society, because more than 50% of her

population is actively involved in agricultural production (National Bureau of Statistics, 2014). The agricultural sector faces many challenges, notably an outdated land tenure system that constrains access to land (1.8 ha/farming household), a very low level of irrigation development (less than 1 percent of cropped land under irrigation), limited adoption of research findings and technologies, high cost of farm inputs, poor access to credit, inefficient fertilizer procurement and distribution, inadequate storage facilities and poor access to markets have all combined to keep agricultural productivity low (average of 1.2 metric tons of cereals/ha) with high postharvest losses and waste (FAO reports, 2018). However, the country is noticeably in the production of some

primary agro products such as; oil palm, cocoa, groundnut and vegetables among others.

Despite all these challenges faced by the agricultural sector in the country, vegetable production trend in Nigeria has assumed upward trend. Leafy vegetables production stood at 826 metric in 1961; 1.09 million tonnes in 1970; 1.76 million tonnes in 1990 and it grew substantially to 7.05 million tonnes in 2016 (FAOSTAT, 2018). According to Udoh and Akpan (2007), vegetables are among the staple food components in the world and their production has continued to increase due to the increasing awareness of the nutritional value derivable from their consumption. Vegetables are good sources of protein, mineral salts, sugars, vitamins, and essential oils that increase man's resistance to disease (Christian, 2007). Francisca *et al.*, (2006) asserted that increased in vegetable production improved food security and offered employment opportunities to many rural women in Nigeria. According to Kebede and Gan (1999), the main sources of farm income for small and limited resource farmers are basically arable crop production consisting of vegetable and non-vegetable crops.

In Akwa Ibom State, vegetable production is popular due to its high consumption rate easily traced to its affordability and availability at all time of the year. Fluted pumpkin (*Telfairia occidentalis*), one of the most popular leafy vegetables has become a permanent component of dietary requirement of most Nigerian especially of the Southern region extraction. The plant is noted to have healing properties; the leaves are rich in iron and protein and are used to cure anaemia (Orhuamen, *et al.*, 2012 and Akwukwaegbu *et al.*, 2016). Flour produced from the seeds can be used for high-protein breads (Kayode *et al.* 2011). Its popularity is linked to the low cost per unit of resource use in the production, short gestation period, being one of the cultural crops, and quick returns on invested fund compared to other crop enterprises (Udoh and Akpan, 2007). Its sustained production is strongly related to resource use efficiency, friendly climatic factors and farm household specific factors among others.

Premised on above assertion, Hussian and Perera (2004) observed that agricultural productivity change is explained by such factor as climatic,

agronomic, and socio-economic and farm management factors. The need to increase food crop production and make food sufficient to all populace is one of the major challenges to the Nigerian government. Farmers in Nigeria are not getting maximum return from the resource committed to the enterprise. Productivity is crucial for real income growth and important for improving economic well-being and quality of life, or at least its material aspects. Due to the population pressure, increasing urbanization and land fragmentation in Akwa Ibom State; vegetable production in the State is mostly practiced in marginal or less fertile land by smallholder farmers under traditional system of farming (Akpan *et al.*, 2010). Sustained vegetable production in the state could be achieved under increasing agricultural resources intensification and dynamic economic environment only if resource utilization occurs in the rational stage of the classical production surface. Given the important of vegetable sub sector to the economy of Akwa Ibom State (i.e. job creation, self-food sufficiency, and food complement source); the constraints inherent in vegetable production and various agricultural programmes as well as policies implemented in the State to boost vegetable production; it has become imperative to empirically analyze determinants of total factor productivity among vegetable farms in the state.

Determinants of total factor productivity of arable crop farms have been investigated by several scientists in different parts of the country using several methodologies subject to varieties of ecological and economic environment characteristics. For instance, Ukoha, *et al.*, (2010) analyzed the determinants of total factor productivity among small-holder cassava farmers in Ohafia Local Government Area of Abia State. The finding revealed that, the coefficients for education and extension were negative and significantly related to total factor productivity (TFP) at 10% level of probability. The coefficients for age, fertilizer and access to credit were positive and significant at 1% level of probability. The coefficients for gender and household size were negative and significant at 1% level of probability. Similarly, Akintayo and Rahji (2011) examined the determinants of total factor productivity in the rain-fed lowland rice

production system. Results indicate significant positive effects of extension visits, commercialization level, farming experience and family labour on total factor productivity. In the same period, Akpan *et al.*, (2011) analyzed factors that affect total factor productivity (TFP) among waterleaf farmers in Uyo and fluted pumpkin farmers in Itu local government areas of Akwa Ibom State, Nigeria. The Ordinary least squares linear regression estimates of determinants of total Factor productivity among waterleaf and fluted pumpkin farmers revealed that farm size, hired labor, age, household size, farmer's income, accessed to credit, experience, water and planting materials were significant factors that affect TFP among waterleaf farms; while farm size, hired labor, income earned, extension visit, credit facilities, fertilizer and planting materials affected fluted pumpkin farms TFP. Also, Obasi *et al.*, (2013) examined factors affecting agricultural productivity among arable crop farmers in Imo State. Empirical results revealed that, age, level of education, years of farming experience, farm size, extension contact, fertilizer use, planting materials and labour use are the main determinants of agricultural productivity in the State. Finally, Hassan, *et al.*, (2014) studied total factor productivity among maize farmers in Nigeria. They identified research and development spending, net value of production, fertilizer price and labor as significant factors that affect total factor productivity growth. It is pertinent to note that, the empirical researches reviewed so far have revealed that, not much work has been done in this area. In Akwa Ibom State for instance, very limited literature are available on this issue among arable crop farmers. Few ones available are localized and might not give view of the entire State.

Again, since the State government has continuously implemented several agricultural programmes and policies as well as interventions in the sector, there is an overwhelming need to periodically assess the productivity status of the emerging enterprise (vegetable production) in the sector. Premised on above facts, the study is aimed specifically at determining the level of total factor productivity and factors that significantly influence it among vegetable farmers in the State.

Methodology

Study Area

This study was carried out in Oruk Anam Local Government Area of Akwa Ibom State. The Local Government Area is located in the Southern part of Akwa Ibom State, Nigeria. It lies between latitude 4° 40'N and 5° N, and longitude 70° 30'E and 70° 50'E. It has a land mass of 511.73km Square representing 7.23% of the state total land mass of 7,081km sq. The area is also comprises of two major political units, the Oruk zone and the Anam zone. It is characterized by a typically humid tropics climate with a distinct dry and wet season. The agricultural season last for up to 9 months. The mean annual rainfall is heavy and lies between 2000mm-4000mm and a temperature range of 26°C – 28°C. The rainy season last from March to November and it's characterized by high relative humidity and heavy cloud cover while the dry season last from December to February. Its inhabitants are mostly farmers, Craft men and civil servants. The population of the local government is about 172,654 out of which males are 86,239 and females are 86,415 (NPC, 2006). Oruk Anam has common boundaries with Ukanafun and Abak in the north, Ikot Abasi in the south, Mkpato Enin in the East and in the West by Ukanafun and Imo River running through the borderline of Rivers and Abia State. It is predominantly agrarian with notable food crops like yam, cassava, cocoyam, maize, pumpkin, okra, melon, oil palm, plantain and banana.

Sampling Techniques and Sample Size

Combination of sampling methods were used to select respondents in the study. The study area consists of 9 clans (Inen, Obio Akpa, Ibesit Nung Ikot, NungIkot, NungIta, Ndot, Ibesit, Ekparakwa, and Abak/Midim). The first stage involves random selection of 5 clans out of the 9 clans in Oruk Anam. In second stage, two villages were randomly selected from each clan. A total of 10 villages were used in the study. The third stage involved random selection of 10 fluted pumpkin farmers from each of the selected village. A grand total of 100 respondents were randomly selected and used in the study.

Source and Type of Data

Cross sectional data were collected from randomly selected fluted pumpkin farming household heads in the study area. Basically, primary data was used in the study.

Method of Data Collection

Data were collected using structured questionnaires and was complemented by personal interview to ensure consistency and accuracy of collected data. The structured questionnaire was administered on 100 farming household heads in the study area.

Analytical Techniques

The total factor productivity (TFP) is equivalent to:

$$TFP = 1/AVC \dots \dots \dots (1)$$

TFP measure the efficiency of all inputs used in production process. Increases in TFP result usually from technological innovations or improvements. Following Key and McBride (2003); Bamidele *et al.* (2008) and Ukoha *et al.* (2010), individual farm TFP can be measured as the inverse of average variable cost. This is so since TFP is the ratio of the output to the Total Variable Cost.

$$TFP = \frac{Y}{TVC} = \frac{Y}{\sum P_i X_i} \dots \dots \dots (2)$$

$$\text{but } AVC = \frac{TVC}{Y} \dots \dots \dots (3)$$

$$\text{Hence } TVC = AVC . Y \dots \dots \dots (4)$$

Inserting (4) into (2) will yield

$$TFP = \frac{Y}{TVC} = \frac{Y}{\sum P_i X_i} = \frac{Y}{AVC . Y} = \frac{1}{AVC} \dots \dots \dots (5)$$

Where Y = quantity of output in kg and TVC = Total Variable Cost (N), Pi = unit price of variable input and X = quantity of variable input. This methodology ignores the role of Total Fixed Cost (TFC) as this does not affect both the profit maximization and the resource-use efficiency conditions. Besides, it is fixed and as such a constant.

Where TVC is the total variable cost of ⁱth farmer and AVC is the average variable cost. Based on the specification of TFP in equation 5,

implicitly factors that affect TFP are specified as follow:

$$TFP = \left(\frac{1}{AVC}\right) = \vartheta_0 + \vartheta_1 FAS + \vartheta_2 EDU + \vartheta_3 SOC + \vartheta_4 EXP + \vartheta_5 EXT + \vartheta_6 HHS + \vartheta_7 AGE + \vartheta_8 FAI + \vartheta_9 GEN + \vartheta_{10} FAS + \mu_2 \dots \dots \dots (3.4)$$

Where;

- TFP = total factor productivity for ith farmer
- FAS = farm size (ha)
- EDU = Education level of ith farmer (year)
- SOC = Membership in social organization (Number of years)
- EXP = Farming experience (Year)
- EXT = Access to extension agent (number of times)
- HHS = Household size (number)
- AGE = Age of farmer in ith household (years)
- FAI = Farm income (Naira)
- GEN = Gender of a farmer (dummy 1 for female and 0 for male)
- FAS = Farm size measured in hectare

Note the components of total variables cost in the study consisted of the following variable costs: cost of manure, cost of fertilizer, cost of hired labour and cost of seeds.

Results and discussion

This section presents empirical factors that affect total factor productivity of vegetable farmers in the study area. The discussion is based on the result of findings.

Calculated Total Factor Productivity of Vegetable Farmers in the Study Area

The distribution of the total factor productivity of vegetable farmers in the study area is shown in Table 1. The finding revealed that, no farmers had TFP less than or equal to 10 units. About 6.00% of the farmers have TFP in the categories of 10.01 – 20.00 and 6.00% in the range greater than 100 units. Similarly, about 8.00% of farmers dwell in the categories of 20.01 – 30.00, 70.01 – 80.00 and 90.01 – 100.00 respectively; while 5.00% of them obtained TFP in the categories of 30.01 – 40.00 and 80.01 – 90.00 each. Meanwhile, more than half of the respondents representing 54.00% of farmers have TFP in the range of 40.01 – 70.00. The

mean TFP stood at 60.10 units, and this implies that majority of vegetable farmers in the study

area are efficiently utilizing their farm resources.

Table 1: Distribution of Total Factor Productivity Index of *Telfairia* Farmers in the Study Area

S/N	Category	Frequency	Percentage	Cumulative Frequency
1	≤ 10.00	0	0.00	0.00
2	10.01 – 20.00	6	6.00	6.00
3	20.01 – 30.00	8	8.00	14.00
4	30.01 – 40.00	5	5.00	19.00
5	40.01 – 50.00	12	12.00	31.00
6	50.01– 60.00	20	20.00	51.00
7	60.01 – 70.00	22	22.00	73.00
8	70.01 – 80.00	8	8.00	81.00
9	80.01 – 90.00	5	5.00	86.00
10	90.01 – 100.00	8	8.00	94.00
11	≥ 100.00	6	6.00	100.00
	Total	100	100.00	
	Mean	60.10		

Source: Computed by authors. (Note, the higher the index of TFP, the higher the efficiency of resource use)

Factors that influence Total Factor Productivity of Vegetable Farmers in the Study Area

Factors that affect total factor productivity of fluted pumpkin farmers were determined and are presented in Table 1. The Ordinary Least Squares method (OLS) was used to estimate this result. The diagnostic statistics shows R² of 0.89663; this means that 89.66% variability in total factor productivity of vegetable is caused by the specified explanatory variables. The F-cal is 14.31723 and is significant at 1% probability level. This means that, the estimated R² is significant and the equation has goodness of fit. Also the normality test shows the chi square value of 19.5937 which is significant at 1% probability level. This means that the error term of the estimated equation is normally distributed and it justified the use of OLS method. The RESET test is 9.06378 and is significant at 1%, this shows that the specification is adequate and the estimated equation have structural rigidity.

The empirical result shows that vegetable farmers’ education, social capital formation, farming experience, extension visit, farm income, gender and farm size have positive relationships with total factor productivity.

The coefficient of years of formal education has a positive sign and was significant at 1% level of probability. This implies that one present increase in the level of education of vegetable farmers in the study area will lead to 0.00866% increase in their total factor productivity. This suggests that increase in education will enhance resource management; it will enable farmers to acquire and process relevant information more effectively. It also equips them with better managerial skills which eventually lead to an improvement in total factor productivity of *Telfairia* production. This result is in agreement with the findings Obasi *et al.*, (2013); but is contrary to Ukoha *et al.*, (2010) finding.

Table 1: Ordinary Least Squares estimates of total factor productivity function for Vegetable production

Variable	Coefficient	Std. Error	t-ratio
Constant	0.75046	0.09228	8.1324***
Education	0.00866	0.00369	2.3417**
Social capital formation	0.00719	0.00104	6.8654***
Farming experience	0.00173	0.00062	2.7877***
Extension agent	0.18570	0.04788	3.8779***
Household size	-0.01413	0.00770	-1.8341*
Age	-0.00080	0.00157	-0.5107
Farm income	0.56064	0.28160	1.9909**
Marital status	-0.01136	0.02907	-0.3908
Gender	0.1019	0.03315	3.0736***
Farm size	0.05844	0.00544	10.7248***
Diagnostic Statistics			
R-square	0.89663		
F-cal	14.31723***		
Normality Test	19.5937***		
Reset Test	9.06378***		

Source: Extract from computer analysis *results*. Asterisks, *** Significant at 1%, ** significant at 5% and * significant at 10%.

Also the coefficient of social capital formation was positive and significant at 1% probability level. This result means that as social capital formation increases by one unit, the total factor productivity of vegetable farmers also increase by 0.00719%. This suggests that farmers in social organization have high potential to increase and enhance the capacity to acquire more information so as to increase *Telfairia* productivity. Increase in social organization also increases social interactions and hence enhance output marketing, input acquisitions and sharing of ideas.

The result also revealed that, the slope coefficient of farming experience showed a positive relationship with the total factor productivity of vegetable farmers and was significant at 1% probability level. This implies that one percent increase in the level of farming experience will lead to a 0.00173% increase in fluted pumpkin farmers' total factor productivity. Our finding implies that, experienced farmers are more efficient in resource use. In addition, experienced farmers are more knowledgeable in the production system and are better able to access and manage the risks involved in the system than

inexperience ones. This result is in line with the finding from Obasi *et al.*, (2013), Akpan *et al.*, (2011), Obasi *et al.*, (2013) and Akintayo and Rahji (2011)

The coefficient of extension agent contributed positively to total factor productivity of respondents and was significant at 1% probability level. This means that one percent increase in the level of extension agent visit will cause about 0.18570 increments in total factor productivity of fluted pumpkin farmers. This result suggests that, increase in extension visits to farmers will bring an improvement in the fluted pumpkin productivity in the study area. The finding corroborates the previous findings of Akintayo and Rahji (2011) and Obasi *et al.*, (2013), but is contrary to Ukoha *et al.*, (2010) assertion.

Result also showed that farm income has significant positive impact on total factor productivity of fluted pumpkin farmers in the study area. This connotes that, as farm income increases, the total factor productivity of farmers' increases too. Empirically, a unit increase in farm income would increase the index of total factor productivity marginally by 0.561. The result is in line with a priori expectation, because increase in farm income

will result from efficient management of farm resources. As farm income increases, more farm resources would be acquire including new technology to enhance or improve farm activities. This finding is in consonance with the findings of Hassan, *et al.*, (2014).

In a similar manner, the coefficient of farm size portrays positive significant influence of farm size on total factor productivity index of fluted pumpkin farmers in the region. This implies that, as farm size of fluted pumpkin farmers increase, total factor productivity index also increase marginally by 0.058. In other words, as their farm size increase, the resource use efficiency also increases. Akpan *et al.*, (2011) and Obasi *et al.*, (2013) have discovered this result previously.

The coefficient of gender is significant and positively related to total factor productivity of fluted pumpkin farmers in the study area. This connotes that, as female fluted pumpkin farmers increase, the total factor productivity index increases too. This finding could likely be linked to the fact that, this sub sector is dominated by female farmers. Ukoha, *et al.*, (2010) found this kind of result in Abia State.

Alternatively, number of household size has negative coefficient and is statistically significant at the conventional probability level. This means that, this variable has negative relationship with fluted pumpkin total factor productivity. That is, as this variable increases, the quantity of fluted pumpkin produced decline. However, age and marital status did not have significant association with the quantity of fluted pumpkin produced in the area. Previously, Ukoha *et al.*, (2011) and Akpan *et al.*, (2011) have submitted similar claims.

Conclusion

The dietary important of vegetable crops especially in region of high incidence of poverty should be overwhelmingly emphasized. Reasons range from its readily availability and affordability to the resource poor citizens. Leafy

fluted pumpkin is more of cultural crops as it constitute significant dietary constituents of most Nigerian. It is one of the most viable instruments used to combat rural poverty and unemployment in Nigeria. It is consumed by all classes of individuals in the society; hence the effective demand for the commodity is ever guaranteed. It is pertinent to note, that the gap in vegetable consumption chain is mostly created by the supply side which has a lot to do with production efficiency. Following this assertion, it is importance to generate workable agricultural framework based on sound empirical analysis to identify policy variables and also design sustainable framework aimed at achieving increase productivity of vegetables in the State and country at large.

Recommendations

Based on the finding of the study, the following recommendations will be appropriate for increasing the vegetable farmer's productivity in the study area.

- All stake holders should help enhance the formation of social groups like farmers' cooperative so that information will be transferred to them in order to increase productivity of fluted pumpkin in the region.
- Government should improve, equip and intensify extension services in order to help sustain or increase the farmer's productivity.
- An increase in years of formal education have positive on the production of *Telfairia*. Government should intensify effort to extent adult education to rural area as this will help farmers to acquire and process relevant information more effectively and also equips the farmers with better managerial skills which eventually lead to an improvement in total factor productivity.

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