Journal of Agriculture and Crops
ISSN(e): 2412-6381, ISSN(p): 2413-886X
Vol. 8, Issue. 2, pp: 105-114, 2022
URL: https://arpgweb.com/journal/journal/14
DOI: https://doi.org/10.32861/jac.81.105.114

Academic Research Publishing Group

Original Research **Open Access**

Econometric Analysis of Fluted Pumpkin Production in Nigeria; Empirical In-Depth Analysis

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Article History
Received: 25 January, 2022
Revised: 3 March, 2022
Accepted: 29 March, 2022
Published: 3 April, 2022

Abstract

A study was carried out to investigate the econometric analysis of fluted pumpkin, Telfairia occidentalis production in South East, Nigeria. For this study, multi-stage random sampling was used to select 222 fluted pumpkin farmers using structured questionnaires and interview schedules. Data were analyzed using both descriptive and inferential statistics. It was observed in the study that the majority of the fluted pumpkin growers were females, married, relatively educated, and within productive age. A high productivity ratio was recorded by 39% of the fluted pumpkin growers due to exposure to agricultural forums and extension visits. Productivity differences across the state varied significantly with higher productivity estimates. Overall total factor productivity (TFP) and partial factor productivity (PFP) values were 11.33 and 111.2. The Majority, 52.2% of the fluted pumpkin farmers disposed of their produce in the local market due to proximity. The profit function analysis result gave N145,309.1, indicating economic viability and profitability of fluted pumpkin. Age, gender, household size, farm size, education, and farming experience influenced both the net returns and land productivity of the fluted pumpkin farmers. Farmers should be encouraged to embrace fluted pumpkin cultivation due to its economic viability, profitability, productivity and sustainability. Government should also assist in subsidizing and providing the needed inputs to encourage fluted pumpkin growers and enhance production as well.

Keywords: Telfairia occidentalis; Investment returns; Partial factor productivity; Total factor productivity.

1. Introduction

One of the most important vegetable crops grown in Southern Nigeria is the fluted pumpkin, Telfairia occidentalis, which is an important component of agricultural produce [1]. Fluted pumpkin is a very important vegetable that is popular in West Africa. It belongs to the family Telfairia occidentalis Hook F. cucurbitaceae. It is a leafy vegetable that produces fruit. Their production is still rooted in Nigerian agriculture and serves as a major spice in the country's cuisine [2]. The Igbo name it Ugu, the Yoruba Ugwu, and the Ibibio/Efik, Nkong. Fluted pumpkin seed includes 3.00 percent moisture, 35.58 percent fat, 5.25 percent ash, 10.20 percent protein, 3.50 percent crude fiber, and 42.27 percent carbohydrate [3]. The edible portions of the crop include the delicate stalk, leaves, petioles, and seeds, which are generally cooked. The seeds of fluted pumpkin can be eaten raw, cooked, or roasted, and they can also be used to make baked goods [4]. Fluted pumpkin seed is high in oil, particularly unsaturated fatty acids, which account for 61 percent of the oil [5]. The seeds are also high in minerals like as calcium, iron, and zinc, as well as vitamins such as B, C, D, E, and K, which are essential for human nutrition [6]. Because of the nutritional value of fluted pumpkin seeds, their aqueous extract has the potential to be used in the manufacture of high-quality vegetable proteins [7]. The edible part of this vegetable is large red seeds, leaves and young shoots use for traditional soup. Protein rich seed can be roasted or grounded for use in porridge. The flesh of the fruit has good oil content which can be used as cooking oil. The protein in fluted pumpkin leaves also aids in the development and maintenance of human structures such as connective tissues, muscles, and neural systems. Fluted pumpkin leaves contain the necessary quantity of protein for hormone balance; tissue heals and controls the acidities of bodily cells and organs [8]. Amongst the different vegetable food s. production and consumption of fluted pumpkin is very important because of their contribution to good health by providing inexpensive source of minerals and vitamins needed to supplement people's diet which are mainly carbohydrates. Apart from food, the majority of farmers produce it to increase farm revenue, which aids in fulfilling other home and domestic demands. Farmers frequently seek to maximize yields and productivity by employing different soil/land management approaches and/or procedures [9]. Improved land management strategies that are consistent with acknowledged ecological and economic principles are more likely to assure agricultural productivity and long-term sustainability [10]. Productivity is the ratio of output to input (capital, labor, land, energy, materials) in the production process [11]. Productivity, according to Alawode, *et al.* [12] is the total output per unit input. It refers to the relative performance of the processes that are employed to convert given inputs into outputs. Productivity can be studied collectively across the economy or individually by industry to evaluate trends in labor growth, pay levels, and technology advancement [3]. The ratio of agricultural outputs to agricultural inputs, for example, is expressed as land productivity. Individual farm products have different densities and measurement units, making it challenging to calculate total outputs and inputs [4]. (Thus, partial factor productivity (PFP) and total factor productivity (TFP) are used to calculate land productivity. The ratio of output to specific inputs employed in the production process (labor, land, capital, etc.) is known as partial factor productivity, whereas total factor productivity is the ratio of total output to total input [13]. In spite of the soil management techniques and land use policies in South East Nigeria, vegetable cultivation in recent times had continued to decline leading to a fall in agricultural growth, drop in farm income, low performance of agricultural share on gross domestic product (GDP) and export earnings, with a prolonged severe poverty. Vegetable production in Nigeria in year 2018, was predicted to be 7.5 million tons [14]. It increased significantly to 16.7 million tons in 2019 at a 20.77 percent annual rate, and then fell to 3.81 percent in 2020. Thus, annual production of vegetables in Nigeria has been staggering due to changing weather conditions. It is on this backdrop that this research emerges in investigating the econometric analysis of fluted pumpkin production in South East, Nigeria which has not being evenly documented and/ or profiled.

2. Materials and Methods

The study was carried out in Ebonyi State which is one of the agrarian states in South East, Nigeria. The state was purposively chosen due to its vegetative attributes and intensive cultivation of vegetables. Ebonyi State is amongst the states in Nigeria with high production of vegetable and cereal crops [15]. They are majorly farmers and

known for domestic food production in Nigeria. Multi-stage sampling technique was employed for sample selection. In the first stage, two local government areas (LGA's) were randomly drawn from Ebonyi North, Ebonyi South and Ebonyi Central which constitute the three agricultural zones of the state. This resulted into six LGA's. In the second stage, four communities were randomly selected from the LGA's making a total of 24 communities. In the third stage, ten fluted pumpkin growers were randomly selected from each of the communities rising to 240 respondents who were administered with questionnaire but out of 240, the study was carried out with only 222 questionnaire which was found useful for data analysis. Others were not taken in the studies due to errors and insufficient information. Data analysis were done using descriptive statistics, costs and returns analysis, cum returns on investment, total and partial factor productivity model, and ordinary least square multiple regression technique. Costs and returns analysis, cum returns on investment were modeled as follows,

NR = TR – TC ----- eqn. (1)

Where:

NR = Net returns (in Naira)

TR = Total Revenue (in Naira)

TC = Total Cost (TVC+TFC) (in Naira)

TVC = Total variable cost (in Naira)

TFC = Total fixed cost (in Naira)

$RI = \frac{NR}{TC}$ ------ eqn. (2)

Where

RI = Returns on vegetable production

Total factor productivity model was stated as follows;

$TFP = \frac{TO}{TI}$ ----- eqn. (3)

Where

TFP = Total factor productivity

TO = Total output (in Naira)

TI = Total input (in Naira)

Partial factor productivity model was equally represented as follows;

$PFP = \frac{TO}{SI}$ ------ eqn. (4)

Where

PFP = Partial factor productivity

TO = Total output (in Naira)

SI = Single inputs (in Naira)

Ordinary least square multiple regression technique was expressed as follows;

$NR = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9) + e$ eqn.(5)

Where

NR = Net returns and Land productivity (Naira)

X_1 = Age (years)

X_2 = Gender (male 1, female 0)

X_3 = Household size (No. of persons)

X_4 = Farm size (ha)

X_5 = Education (years)

X_6 = Farming experience (years)

X_7 = Marital status (married 1, single 0)

X_8 = Cooperative membership (yes 1, no 0)

X_9 = Extension contacts (No. of contacts)

e = error term

The variables selected were socio-economic factors associated with agricultural production of farmers. According to literature, they influence significantly, the performance and/ or outcome of agricultural enterprise. In most cases, they are major determinants of agricultural production [16].

3. Results and Discussion

Table-1. Socio-economic characteristics of fluted pumpkin farmers

Variable	Frequency	Percentage	Mean
Age (years)			43.0
30 – 39yrs	39	17.6	
40 – 49yrs	112	50.4	
50 – 59yrs	41	18.5	
60 and above yrs	30	13.5	
Gender (M/F)			
Male	70	31.5	
Female	152	68.5	
Household size (No. of persons)			7
1-4	19	8.6	
5-9	193	86.9	
10-14	10	4.5	
Farm size (Hectare)			2.6
0.1-1.0	78	35.1	
1.1-2.0	23	10.4	
2.1-3.0	121	54.5	
Education			
No Formal Education	22	9.9	
Primary Education	69	31.1	
Secondary Education	113	50.9	
Tertiary Education	18	8.1	
Farming Experience (Years)			13
1-5yrs	44	19.8	
6-10yrs	77	34.7	
11-15yrs	101	45.5	
16-20yrs	-	-	
21 and above yrs	-	-	
Marital Status (M/S)			
Married	194	87.4	
Single	28	12.6	
Cooperative Membership			
Member	190	85.6	
Non-Member	32	14.4	
Extension Contacts			
Contacts	188	84.7	
No Contacts	34	15.3	

Field survey data, (2020)

The socio-economic characteristics of fluted pumpkin farmers were presented in Table 1. The majority of the fluted pumpkin farmers 50.4% were within productive age, i.e. between 40 – 49 years, this also reflected on the mean age of the fluted pumpkin growers, which is 43 years. The overall implication indicated that the growers were not that old but strong to carry out their farming operations and this triggered increased production and output [17]. The gender representation showed that female farmers 68.5% dominated the entire area as compare to their male farmers. This implies that fluted pumpkin production was majorly cultivated by the women folk. The farmers had a mean household size of 7 persons; this implies that the household size was relatively large which was evenly utilized in fluted pumpkin production in the area. The maximum number of the farmers cultivated approximately 3 hectares of farmlands implying that the cultivated farm lands were relatively large and this is due to inherited farmlands coupled with gifted farmlands. Amongst the farmers, most of the farmers approximately 50.9% had secondary education which implies that they were more educated and this helped in boosting their farm production [18]. Again, majority of the farmers 45.5% had between 11 to 15 years of farming experience with a mean of 13 years, this implies that the farmers were equally experienced in farming and this assisted them in overcoming inherent farm production challenges. In this study, it was noted that, 87.4%, of the farmers are married and they are more engaged in fluted farming cultivation and very less in single category for cultivation of this fluted pumpkin farming. This is as a result of their commitment for family upkeeps and responsibility. Majority of the farmers, 85.6% belong to cooperative societies as benefits of membership in cooperative societies abounds. Majority of the farmers, 84.7% had contacts with extension agents. This implies that the farmers had enough practical fields experience targeted at

increasing fluted pumpkin production and productivity in the area. Extension services induce crop cultivation which engenders maximum yields/outputs, productivity and higher farm income [19].

Table-2. Land productivity ratios of fluted pumpkin farmers

Productivity Ratios	Frequency	Percentage
0.001-0.009	12	5.4
0.010-0.019	21	9.5
0.020-0.029	31	14.0
0.030-0.039	40	18.0
0.040-0.049	32	14.4
0.050-0.059	60	27.0
0.060-0.069	20	9.0
0.070-0.079	06	2.7
Total	**222**	**100**
Mean	**0.0502**	
SD	**0.0091**	

Field survey data, (2020)

The land productivity ratios of fluted pumpkin farmers were presented in Table 2. It revealed from the Table that a threshold value of 0.050 was used to isolate the fluted pumpkin growers into high and low productivity. It showed that high productivity ratios were recorded by 39% of the farmers, while about 61.3% had low productivity ratios. The high productivity ratios might be as a result of the farmers' exposure to agricultural seminars, forums, meetings coupled with extension contact services and administration in the area. These exposures improved on the knowledge of the farmers towards fluted pumpkin production. Furthermore, the low standard deviation obtained from the result further reflected the utilization of the knowledge and experiences gathered from agricultural forums and extension visits.

Table-3. Productivity differences of fluted pumpkin farmers across the states

Zone	Mean Outputs	Mean Inputs	TFP	PFP
Ebonyi North	8890177.80	2990855.19	2.97	33.7
Ebonyi South	8161002.01	2258041.04	3.61	41.0
Ebonyi Central	9430412.71	1982041.01	4.75	36.5
Total	**26481592.52**	**7230937.24**	**11.33**	**111.2**

Field survey data, (2020)

The productivity differences across the states were presented in Table 3. Productivity differences were isolated into total factor and partial factor productivity with respects to mean outputs and inputs across the state. Ebonyi Central had an overwhelming percentage increase of about 115.6% in mean outputs over Ebonyi South and 106% over Ebonyi North. This implies efficient utilization of inputs transiting into higher production of outputs in Ebonyi Central. The mean inputs recorded across the state showed that Ebonyi North seemingly had about 132.4% increase in mean inputs over Ebonyi South and 150.9% increase over Ebonyi Central. This implies a higher usage of mean inputs in Ebonyi North relative to Ebonyi South and Ebonyi Central. Total factor productivity estimates showed higher values with Ebonyi Central having the highest total factor productivity across the state. Furthermore, the partial factor productivity estimates also produced higher values with Ebonyi South leading other zones. The variations in productivity estimates across the zones may be due to both internal and external production factors. An overall TFP and PFP estimates, 11.33 and 111.2 indicated higher productivity values implying that fluted pumpkin production in the state is economically viable, and productive.

Table-4. Marketing channels of fluted pumpkin farmers

Marketing channels	Frequency	Percentage
Farm gate	47	21.2
Local market	116	52.2
Urban market	59	26.6
Total	222	100

Field survey data, (2020)

The Marketing channels of fluted pumpkin farmers were presented in Table 4. It could be seen that majority, 52.2% of the fluted pumpkin farmers utilized the local market in disposing of their produce. This was as a result of proximity of the market to the farmers. About 21.2% of the farmers used the farm gate method in disposing freshly harvested fluted pumpkin due to the remoteness of the major markets coupled with bad roads networks leading to the market and transportation difficulties. Again, about 26.6% of fluted pumpkin farmers used the urban market in selling off their wares. The use of the urban market may be associated with higher profits.

Table-5. Costs and returns of fluted pumpkin production

Items	Amount (Naira)
A. Total Revenue	190, 300
Variable cost	
Hired Labor (planting, weeding, harvesting)	7700.61
Organic fertilizer used	4200.80
Agrochemical (Insecticides)	1750.81
Improved seedlings planted	4030.33
Transportation cost to market	2091.43
Packaging/loading and offloading cost	2392.03
Storage cost	3280.64
Others (feeding cost, etc)	1098.37
B. Total variable cost	26545.02
Fixed cost	
Land rent	9292.90
Interest on loans	5039.09
Depreciation of fixed items	2730.93
Property Taxes	1382.96
C. Total fixed cost	18445.88
D. Total cost (B + C)	44990.90
Net return (A-D)	145,309.1
Return on investment	3.23

Field survey data, (2020)

The costs and returns of fluted pumpkin production in the state were shown in Table 5**.** Relatively high total revenue, N190, 300 was estimated from the sales of fluted pumpkins by the farmers. A total variable cost, N26545.02 was obtained and this indicated all the variable cost of production incurred in production such as labor, agrochemicals, organic fertilizer, etc. Again the total fixed cost, N18445.88 was also estimated and includes all the fixed items/cost incurred during production such as rent, interest on loans, taxes, and depreciation of fixed items. The total cost, N44990.90 was estimated which is a cumulative of total variable cost and total fixed cost. Furthermore, a relatively high net return, N145, 309.1 was obtained, which implied that fluted pumpkin production in the state was highly profitable and economically viable and therefore should be encouraged in the state. The net returns realized further showed that the farmers were able to maximizes profit and minimize losses as evidenced in the monetary value obtained from the variable cost of production. Return on investment showed an increasing rate of returns on fluted pumpkin production. This implies that for every N1 invested in fluted pumpkin production, there is a corresponding percentage return of 323%.

Table-6. Multiple regression determinants of socio-economic factors influencing netreturns of fluted pumpkin farmers

Variable	Exponential	Linear	Semi-log	Double-log
Constant	403.072 (1.214)	6.31152 (3.408)***	42.3408 (0.772)	6.8092 (1.822)*
Age (X_1)	-3.3950 (-0.934)	-4.0059 (-0.911)	-7909.01 (-0.777)	0.7238 (1.105)
Gender (X_2)	-722.433 (-2.902)**	-4.06390 (-2.751)**	-628.918 (-0.650)	-3.05851 (-1.257)
Household size (X_3)	-015.414 (-0.113)	-0.51660 (-0.911)	-1335.05 (-1.78)	-3.0829 (-1.407)
Farm size (X_4)	2032.10 (0.049)	0.19450 (3.71)***	2284.82 (3.100)***	0.50159 (3.92)***
Education (X_5)	580.551 (4.410)***	2.90402 (4.021)***	4959.69 (3.071)***	0.65001 (3.602)***
Experience (X_6)	262.303 (1.033)	0.52056 (3.006)***	2949.71 (1.26)	0.38322 (0.94)
Marital status (X_7)	815.36 (0.029)	0.30599 (1.414)	360.032 (0.849)	4.0955 (0.506)
Membership in cooperative (X_8)	3381.81 (1.041)	0.85276 (3.502)***	0.79502 (2.741)**	0.66188 (1.999)*
Extension contact (X_9) R^2	18.8931 (1.59)* 0.781	44.0931 (3.191)*** 0.778	1.48413 (2.290)** 0.690	16.9431 (1.451) 0.606
F- ratio	9.307***	47.28***	12.14***	10.4***

Field Survey data, (2020)
Significant @ ***1%, **5% and *10%

The multiple regression determinants of socio-economic factors influencing net returns of fluted pumpkin farmers were shown in Table 6. Linear functional form provided the best fit and was chosen as the lead equation because it had the highest value of the coefficient of multiple determinations (R^2), the highest number of significant variables, and F-value respectively. The R^2 of the total variations in the dependent variable (net returns) were hugely influenced by the socio-economic factors examined. The F-value gave a good fitness for the model. Gender variable was negative and statistically significant. This implies that the female farmers had more of net returns arising from fluted pumpkin production relative to their male counterparts. The coefficient of the farm size was positive and significant, implying that any increase in farm size will result in a corresponding increase in net returns of the farmers. This is true because increase in farmlands induces more land cultivations resulting in increased production and thus, increase in net income of the farmers [20]. Education coefficient was positive and significant, implying that 1 percent increase in educational attainment of the farmers will result in 1 percent increase in net returns of the farmers. Education enhances the intellectual capacities of the farmers and thus, improves farm production [21]. Farming experience coefficient was also positive and significant, implying that any increase in farming experience of the farmers will also lead to a resultant increase in net returns of the farmers. This means that the more the farmers advance in their farming occupation, the more they acquire more of farming experiences which positively translate to higher productivity and net returns. Membership in cooperative coefficient was significant, implying that increase in cooperative membership will result in a corresponding increase in net returns of the farmers. That is membership in cooperative societies avails the farmers' relevant information and access to improved and affordable farming inputs such as seedlings, agrochemicals, capital, etc which induce increase in farm production and net returns. Consequently, the coefficient of extension contact was equally positive and significant; this implies that 1 percent increase in access to extension contact of the farmers will invariably result in 1 percent increase in net returns of the farmers. Extension contacts offer the farmers the requisite access to vital information and practical field experiences required for effective and efficient positive results targeted in improving farm production and net returns.

Table-7. Multiple regression determinants of socio-economic factors influencing land productivity of fluted pumpkin farmers

Variable	Exponential	Linear	Semi-log	Double-log
Constant	4401.01 (1.301)	6.002 (2.171)**	512032 (-0.711)	2.2022 (3.721)***
Age (X_1)	2.6440 (2.961)**	0.40229 (0.911)	4329.27 (0.677)	0.74919 (3.403)***
Gender (X_2)	-521.16 (-2.912)**	-0.673 (-2.471)**	-822.028 (-0.900)	-0.8880 (-3.807)***
Household size (X_3)	819.324 (1.445)	0.5114 (0.111)	4315.35 (3.481)***	0.9721 (1.207)
Farm size (X_4)	3031.30 (1.047)	0.6928 (2.511)**	32604.81 (3.390)***	7.3219 (3.721)***
Education (X_5)	481.353 (3.530)***	0.91490 (1.408)***	8911.71 (3.186)***	0.7533 (3.960)***
Experience (X_6)	363.544 (1.731)*	0.5028 (3.661)***	9183.29 (1.363)	0.1281 (2.881)**
Marital status (X_7)	-714.240 (-1.029)	-0.4081 (-1.312)	-305.233 (-0.619)	-8.4744 (-0.856)
Membership in cooperative (X_8)	4381.07 (0.841)	588.049 (0.831)	92.0251 (1.891)*	0.50582 (2.991)**
Extension contact (X_9) R^2	3.56381 (1.46) 0.679	3.87221 (2.29)** 0.728	0.09032 (0.188) 0.791	4.54301 (2.966)** 0.886
F-ratio	14.04***	19.81***	14.14***	31.9***

Field Survey data, (2020)
Significant @ ***1%, **5% and *10%

The multiple regression determinants of socio-economic factors influencing land productivity of fluted pumpkin farmers were shown in Table 7. Double-log functional form was chosen as the lead result based on its outstanding number of significant variables, highest R^2 and F-ratio. The F-value showed the overall fitness of the model. The R^2 further showed that the total variations in the dependent variables were fully explained by the independent variables investigated. Age, household size, farm size, education, farming experience, membership in cooperative, extension contacts were all positively related to land productivity except gender and marital status and were significant respectively. For instance, age coefficient was significant, implying that a percent increase in the age of the farmers, will result in a corresponding increase in land productivity in the area. This further means that as the farmers advance in age, their production potentials increases leading to increase in land productivity [22]. Gender had a negative coefficient and was significant, implying that more of the female farmers were deeply involved in fluted pumpkin production with increased productivity compared with the male farmers. This is true because fluted pumpkin cultivation is noticeably and traditionally associated with the women folks. Farm size was also significant,

implying that as farm size increases, farmer's production and productivity levels increases too. It is generally true that increase in farm size increases farm production leading to increase productivity of the farmers, as farmers tends to cultivate more with more of available lands at their disposals. Education was also significant, implying that any increase in educational level of the farmers will result in a corresponding increase both in production and land productivity of the farmers. Education is a vital tool meant to reposition performance of farmers' at all times [23]. Again, the coefficient of farming experience was significant, implying that increase in farming experience will equally lead to increase in farm production and productivity levels. This means that any iota of farming experience gained will reflect correspondingly in increased productivity of the farmers. Farming experience enables farmers to overcome inherent production challenges resulting in increased farm production. Membership in cooperative coefficient was significant, implying that increase in membership of cooperative societies increases the productivity of the farmers. This is true because farmers that belong to cooperative societies are more informed and enlightened than farmers with no membership as this obviously reflect in their farm productivities. This is probably due to relevant information gotten from such association coupled other farm input incentives [24]. Consequently, extension coefficient was equally significant, implying that 1 percent increase in extension services will result in 1 percent increase in productivity of the farmers. This means that as farmers access more of extension services, their productivity levels increases rapidly leading to improved net income. Extension services are vehicles of agricultural transformation which moves farmers from low productivity to high productivity levels [25].

Table-8. Production/marketing constraints of fluted pumpkin farmers

Constraints	**Frequency	Percentage
Lack of access to credit	209	94.1
Lack of storage facilities	114	51.3
Lack of extension services	41	18.5
High cost of farm inputs	204	91.9
High cost of labour	190	85.6
Pest/disease attack	109	49.1
Climate change	222	100
Lack of access to markets	189	85.1
Theft	151	68.0
Spoilage	201	90.5
Low/poor market patronage	19	8.6

Field Survey data, (2020)

The production/marketing constraints of fluted pumpkin farmers were shown in Table 8. Multiple responses were obtained regarding the production and marketing constraints of the farmers. All the farmers attested that climate change affected their farm production, while other farmers had difficulty in accessing credits from commercial banks, agricultural banks, etc. The farmers averred that their inability to provide collateral services required by the banks prevented them from accessing credits while majority of the farmers were discouraged by high interest rates charged by the banks. Farmers complained about lack of good storage facilities, lack of adequate extension services. Fluted pumpkin being a perishable produce required good storage facilities which were not available. Extension services are instruments of positive changes in relation to farm production but were not accessed by the minority of the farmers. Again, high cost of farm inputs, labor, pest/disease attacks were reported by the farmers. Farmers indicated lack of access to markets, theft, spoilage, and low/poor market patronage, respectively. These indicated factors obviously marred both production and marketing potentials of the fluted pumpkin farmers, and as a result affected their net income and/ or profit levels. However, the cultivation of fluted pumpkin in the state maximized economic returns and increased productivity of the land.

4. Conclusion and Recommendations

Conclusively, the findings of the study showed that the socio-economic disposition of the farmers in the state regarding fluted pumpkin production varied in terms of age, gender, household size, etc. The study also revealed that there is more male participating in fluted pumpkin production in the study area. It also revealed that most of the respondents were between the ages of 40-49 years. It was found that majority of the respondent were married, few of them were single. It was also concluded that most of the respondents have 5-10 household size that could be of help in their family labour. From the gross margin analysis carried out in this study, fluted pumpkin production is said to be a profitable venture. This is because, the state recorded high productivity ratios arising from farmers' exposures to agricultural forums and extension visits. Again, TFP and PFP estimates indicated higher productivity values. Majority of the fluted pumpkin farmers utilized the local market in disposing of their produce. Returns on investment showed an increasing rate of returns on fluted pumpkin production in the state. Age, gender, household size, farm size, education, farming experience, etc influenced both the net income and land productivity of the fluted pumpkin farmers. A number of factors constrained fluted pumpkin production such as climate change, capital, high cost of farm inputs, etc. The study recommended farmers who are yet to engage in fluted pumpkin production to tenaciously embrace its cultivation due to its economic viability, profitability, productivity and sustainability. Government

should also assist the fluted pumpkin growers in providing the needed inputs to enhance fluted pumpkin production in the state.

Acknowledgments

The authors acknowledged the contributions of Agricultural Development Programme Coordinator (ADP), Ebonyi State

Declaration of interest statement

The authors declare that no competing interest exists, and the paper has not been submitted to any other journal.

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