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PROFITABILITY ANALYSIS OF DRY SEASON FLUTED PUMPKIN PRODUCTION AMONG SMALLHOLDER FARMERS IN OKIGWE, SOUTHEASTERN NIGERIA

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ABSTRACT

The study analyzed the profitability of dry season fluted pumpkin production among smallholder farmers in Okigwe, Southeastern Nigeria. Data were collected with the aid of well-structured questionnaire and interview schedule using simple random sampling technique. Data were analyzed using descriptive and inferential statistics. Result showed that the smallholder fluted pumpkin farmers in the area had mean age of 39 years and majority (61.7%) were female who were mostly (76.7%) married with household size of 5 persons. Majority (51.7%) had secondary education with mean farming experience of 5 years and mean farm size of 0.5417 hectare. Majority (66.7%) were none members of cooperative society and greater percentages (71.7%) have never had extension contact but their mean annual farm income was ₦73,550. Result further showed that, the total cost and total revenue of production were ₦163,005 and ₦338,340 respectively. Net return was ₦175,335, Benefit to cost ratio was 2.08 and return on investment was 1.08, with shepherd future of 48%. The sources of water for dry season production analyzed, showed that majority (55%) of the farmers use perennial stream, and wastewater (26.7%). Results also, revealed the constraints on profitable fluted pumpkin production in the area. These constraints were categorized into production, economic and managerial. The major production constraints were inadequate improved varieties of seeds (0.518), and poor feeder roads (0.581). Also the economic constraints were high cost of inputs (0.526), and inadequate credit facilities (0.5331). The major managerial constraints were inadequate extension contact (0.5885), poor market information (0.563), and Lack of irrigation facilities (0.518). However, dry season fluted pumpkin production in the area was profitable and recommended regular extension contacts, provision of irrigation facilities and good road network.

Keywords: *Profitability; Dry season; Fluted Pumpkin; Smallholder; Okigwe.*

INTRODUCTION

Telfairia occidentalis (fluted pumpkin) "Ugu" is a member of the Curcubitaceae and a popular vegetable widely grown and consumed in Nigeria and across the tropics (Nwanguma and Akinpelu, 2020). It is widely cultivated all year round, in Southern Nigeria as a leaf and seed vegetable. Rain-fed crop production is between March and November while the dry season irrigated crop is between November and March. *Telfairia* is propagated by seeds and in some cases, vegetative. It thrives better in well-drained soils but it is not shade-loving. *Telfairia* is an important crop grown for its leaves and edible seeds. It is highly acceptable among the Nigerian populace and it brings better returns compared to other common tropical leafy vegetables (Layade, *et al.*, 2020). According to them, leaves and seeds of *Telfairia* are of high nutritional, medicinal and industrial values, being rich in protein, fat and vitamins and therefore calls for regular consumption. The seeds are used as propagating materials, eaten roasted, boiled or blended to paste as soup thickener.

The cultivation/production of *Telfairia* has increased rapidly as a result of its economic values in terms of monetary return to the growers especially during dry season farming. *Telfairia* production can provide all year round income generating employment opportunities for the farmers with little capital investment (Layade, *et al.*, 2020). Farmers strive to maximize yield of high quality using effective chemical substances on the crop grown. Nitrogen is essential for adequate vegetation and should ideally be given in the form of manure, applied before planting. The use of well-decomposed manure is essential for fruit production and in this case it is recommended that about one kilogram of manure/ plant be applied. Fluted pumpkin is perennial when grown on well-drained soils, slightly shaded and mulched but not so soggy soils (Idowu, *et al.* 2007). n the study area, the crop is grown on poor soils as an annual during the rainy season and also during the dry season adopting manual irrigation practices. Majorly, it is grown along-side other crops such as yam, maize, cassava e.t.c. as against Olowa and Olowa (2016) who maintained that fluted pumpkin is not majorly grown along-side other crops as done in other climes. Fluted pumpkin is very important in the diet of children, men, women, nursing mothers as well as livestock due to its high nutritive value. But in Nigeria, the output has not been able to meet the

demand for human food not to mention that of livestock feed. As a result of the growing need, the task of producing enough fluted pumpkin poses an increasing challenge. Like other crops, it is affected by the seasonality syndrome, hence, the irrigation practices in dry season. In spite of various initiatives aimed at improving the horticultural sub-sector such as vegetable sector which fluted pumpkin is inclusive, the sector still remains relatively under-developed. The horticultural sub-sector also reflects the problems in the agricultural sub-sector. These problems include inadequate knowledge and technology of production, insufficient planting materials, land tenure, poor extension services and insufficient postharvest facilities (Babatola, 2004). Vegetable crop production creates jobs. On average it provides twice the amount of employment per hectare of production compared to other crop types (Ali, *et al.* 2002). The move from cereal production towards high-value vegetable crops such as fluted pumpkin is an important contributor to employment opportunities in developing countries (Joshi, *et al.* 2000).

However, several studies have shown that dry season fluted pumpkin production were profitable. Nwauwa and Omonona (2010) in their study on fluted pumpkin production under irrigation system in Ilorin found fertilizer, labour, and plot size as significant factors. More specifically, Ayinde, *et al.* (2007); Idowu, *et al*. (2007) examined economic factors affecting the production of fluted pumpkin using a modified cost-route approach and reported fluted pumpkin production as being profitable under existing production systems with an average net income of $205.90/ha on a mean farm size of 0.301. Olowa and Olowa (2016) assessed the profitability of growing fluted pumpkin on commercial scale in Ikorodu Local Government Area (ILGA) using frequency distribution, percentages, means, gross margin, net profit, benefit-cost and Shepherd-Future analyses, and exponential regression model of combined profit function for irrigation and rain-fed systems. Results showed that fluted pumpkin farming was equally undertaken by both male and female mostly between 41-50 years old, with no formal education and average family size of 6 per household, net profit of ₦380,150 and ₦207,150 and benefit-cost ratios of 2.7 and 3 for rain-fed and dry season/irrigated practice respectively. According to them, farm size and level of education have positive correlation while age and costs of fertilizer, labour and planting materials were negatively related to farmer's profit at 1% and 5% significant level and maintained that, farmers should not invest in irrigation for fluted pumpkin production and that, increased access to land, fertilizers and improved seeds would promote profitability and commercialization of fluted pumpkin enterprises in Nigeria. Akanni-John, *et al.* (2020) analyze the economics of fluted pumpkin production in Ibadan metropolis using descriptive statistics such as frequency, percentage, profit function analysis, gross margin and fluted pumpkin production was found to be a profitable venture in the study area.

In this study, the profitability analysis of dry season smallholder fluted pumpkin production in Okigwe, Southeastern Nigeria was analyzed. Specifically, the study described the socioeconomic characteristics of fluted pumpkin farmers, estimated the profitability of dry season fluted pumpkin production, identified the sources of water for dry season production of fluted pumpkin and analyzed the constraints on profitable fluted pumpkin production in the area.

THEORETICAL FRAMEWORK

In economic theory, a production function is described in terms of maximum output that can be produced from a specified set of inputs, given the existing technology available to the farmer (Utobo, *et al.* 2017). Production refers to the number of units of output, a farm produces over a given period of time. From a microeconomics standpoint, a farm that operates efficiently should attain sound knowledge of its total product, marginal product, and average product (Saari, 2006). Production is a process of combining various material inputs and immaterial inputs (plans, know-how) in order to make something for consumption (output). It is the act of creating a good and service which has value and contributes to the utility of individuals (Kotler, Armstrong, Brown, and Adam 2006). In order to produce goods and services which can be sold, and generate revenue and profits, a farm must purchase or hire scarce inputs, which are its factors of production. Production theory concerns itself with the problems of combining various inputs, given the state of technology, in order to produce a stipulated output. The technological relationship between inputs and output is known as production function. The production function expresses a functional relationship between quantities of inputs and output. It shows how and to what extent output changes with variations in inputs during a specified period of time (Utobo and Nwankwo, 2019). In economics, land refers to the earth soil and its natural resources such as minerals, water, oil, forests etc. Efficiency of land refers to the productive capacity of land (Jhingan, 2002). The efficiencies of land at different places depend upon factors such as soil, climate, and topography, improved method of cultivation, irrigation method, ownership and government policy (Otariba, 1980). In all economic activity, human effort is necessary to work. Thus human effort, which is vital for production, is called "Labour". Labour can be manual labour, working with one's hands and body mainly or it can be mental labour-using one's brain. Jhingan (2002) stated that efficiency of labour refers to the productive capacity of labour. The term Capital is defined

as a stock of physical assets accumulated by society to facilitate the production of goods and services. It is any form of wealth set aside for production of further wealth. Capital is a man-made wealth used in the production of goods and services. To attain profitability in any production process, all these factors must be combined in the most efficient manner. Profitability is the primary goal of all business ventures. Without profitability the business will not survive in the long run. So measuring current and past profitability and projecting future profitability is very important. Profitability is measured with income and expenses. Income is money generated from the activities of the business. For example, if crops and livestock are produced and sold, income is generated. Profitability ratios are financial metrics used by analysts and investors to measure and evaluate the ability of a company to generate income (profit) relative to revenue, balance sheet assets, operating costs, and farmers' equity during a specific period of time (Saari, 2002).. They show how well a farm utilizes its assets to produce profit and value to the farmer. A higher ratio or value is commonly sought-after by most farms, as this usually means the farm is performing well by generating revenues, profits, and cash flow. The ratios are most useful when they are analyzed in comparison to similar farms or compared to previous periods.

METHODOLOGY

Study Area

The study was conducted in Okigwe, Southeastern, Nigeria. It lies between 5'30'N to 5'57'N and 7'40E to 7'55'E with population of 132,237 (NPC, 2005). Okigwe has average annual rainfall of 2330mm and mean annual temperature of 36^0C (Okigwe ADP, 2008). Most of the population is made up of immigrant workers from other states. Okigwe has a land mass of 1,824km^2 and the people of Okigwe cultivate mostly such crops as fluted pumpkin, cassava, palm trees, yam, watermelon, garden egg, maize among others

Sampling Techniques

Simple random sampling technique was adopted for this study.

Stage 1: Okigwe has five (5) autonomous communities. They include Aku, Agbobu, Umulolo, Umuawa Ibu and Okigwe urban.

Stage 11: The study randomly selected three (3) autonomous communities, namely; Agbobu, Aku and Umulolo.

Stage 111: Twenty (20) smallholder fluted pumpkin farmers were selected randomly from each of the three (3) autonomous communities to give sixty (60) smallholder fluted pumpkin farmers for the study.

Method of Data collection

Primary data for this study were sourced with the aid of well-structured questionnaire and interview schedule in the case of illiterate farmers.

Data Analysis

Data generated for this study were analyzed using descriptive statistics such as frequencies, means and percentages; cost and return analysis such as net return, return on investment, cost-benefit ratio and shepherd future; and principal component factor analysis (PCA). Objectives I and III were achieved using descriptive statistics such as tables, frequencies and percentages. Objective II was achieved using cost and return analysis while objective IV was achieved using principal component factor analysis (PCA).

Model Specification

Costs and Returns Analysis

The costs and returns analysis that was used for this study is expressed thus, (Olowa and Olowa, 2016)

$$NR = TR - TC \quad (1)$$

$$TR = Q \times P \quad (2)$$

$$ROI = NR/TC \quad (3)$$

$$BCR = TR/TC \quad (4)$$

$$SF = (TC/TR) \times 100 \quad (5)$$

Where,

NR = Net return on fluted pumpkin vines and fruit (Naira)

TR = Total revenue from fluted pumpkin vines and fruits (Naira)

TC = Total Cost of fluted pumpkin production (Naira)

Q = Quantity of fluted pumpkin vines and fruits (Kilogram)

P = Unit price of fluted pumpkin vines and fruits (Naira)

ROI = Return on investment in fluted pumpkin Production (Naira)

SF = Shepherd future (Percentage)

Factor Analysis

The study used the Principal Component Analysis (PCA) or factor loading according to Nwibo and Okorie (2013) to achieve objective IV. From them, PCA was predicted on the assumption that:

i. The observable factors, F_j were independent of one another and the error terms, and such that $E(F_j) = 0$ and $Var(F_j) = 1$. Therefore, each observable variable or factor Y_i is a linear function of independent factors, F_i and error terms, ei. Quantitatively, factor analysis is linearly represented as:

$$Y_i = \alpha_{i0} + \alpha_{i1}F_1 + \alpha_{i2}F_2 + \alpha_{i3}F_3 + \alpha_{i4}F_4 + \alpha_{i5}F_5 + \alpha_{i6}F_6 \ldots + \alpha_{in}F_n + e_i \quad (6)$$

Where:

α_i= Parameters or Loadings. Thus, $\alpha_1 \_ \alpha_n$ is the coefficient of loading of variable Y_i on factors F_n.

ii. The error terms e_i are independent of one another, such that $E(e_i) = 0$ and $Var(e_i) = \delta_i^2$. Thus, each e_i is an outcome of a random draw with replacement from a population of e_i values having mean of 0 and certain variance, δ_i^2

From the rule of thumb as developed by Kaiser and adopted by Nwibo and Okorie (2013), variable with a minimum of loading of 0.4 can be isolated as being positive to the attribute in question. Therefore, objective IV was subjected to factor analysis.

RESULTS AND DISCUSSION

The results on socioeconomic characteristics of smallholder fluted pumpkin farmers, profitability of dry season fluted pumpkin production, sources of water for dry season production of fluted pumpkin, and finally, the constraints on profitable fluted pumpkin production were discussed and presented in the tables below.

Table 1 indicated that smallholder fluted pumpkin farmers in the study area had mean age of 38.52 years, which implied that the farmers were at their active, innovative and productive age. This finding was in consonance with the findings of Onyebinama (2004) who reported that the technical and managerial competence of the farmers would be determined by age, which is likely to influence his attitudes, motivations and behavioural patterns which in turn influences innovation adoption and sensitivity to risk. Innovation adoption would likely increase as age of the farmer increases. In the light of the above the youths need to be considered and encouraged in the implementation of intervention projects in the study area. Majority (61.7%) of the farmers were female and greater percentages (76.7%) of them were married, with mean household size of five (5) persons. These findings agreed with Akpan, *et al.* (2012) who reported female dominance in waterleaf and fluted pumpkin production in Southern Nigeria which revealed the significance of agricultural activities to the sustenance of women folk especially married ones with sizeable household size as seen in the study area. These results disagreed with Mustapha *et al.* (2016) who reported male dominance in vegetable production in Northern Nigeria with high household size. Majority (51.7%) of the farmers had secondary education with mean farming experience of six (6) years and mean farm size of 0.5 hectares. The educational attainment of the farmers showed that, at least, they can read and write and adapt to the technicalities of innovations, product and factor markets and the bureaucratic procedures of farm firm. Five (5) years of farming experience showed that the farmers were still young in the field, though, Onubuogu (2013) observed that years of farming experience would boost the skills of the farmer and a better understanding of the risks associated to farming and the skills for effective resource utilization as well as could predict market condition for higher profitability. The mean farm size of 0.5 hectares showed that the farmers were smallholders and any holding less than 3 hectares is small and farmers within the bracket are smallholder farmers (World Bank, 2007). This result also agreed with Awoke (2002), Alimba and Ezinwa (2001) whose works reported that most of the farmers in Nigeria were smallholders who cultivated less than 3 hectares annually. And also, in agreement with, FMAWR, 2008, Ogisi *et al*. (2012) whose works maintained that more than 90% of agricultural output is provided by smallholder farmers with less than two (2) hectares under cultivation. Majority (66.7%) of the farmers did not belong to social organization while (33.3%) of the farmers belong to social organization. This revealed the reasons why farmers complained inadequacy of all necessary production inputs for fluted pumpkin production in the area. Membership of social organization implied that the farmers could jointly pool their resources together to enhance efficiency and easily obtain loan, and input grants from the government, and also enables the farmers to exchange ideas, as well as adoption of modern farming techniques and the need to purchase inputs in large quantities so as to enjoy bulk discount. Membership of cooperative society means that the farmers could pool their resources together among others and ease their access to agricultural loan facility to increase and contribute to solving the food security challenge of the country (World Bank, 2007). Majority (71.7%) of the farmers never had extension agents' visit. This revealed the inadequacies of extension agents in the area and this would translate to their inability to identify the weaknesses and strength of the farmers so as to guide them in the adoption and acceptance of new techniques and technologies in fluted pumpkin production. This would also mean a gap between extension agents and farmers. The mean annual farm income of smallholder fluted pumpkin farmers in the area was ₦73,550. This mean annual farm income really showed that the farmers were still smallholders who have little or no access to improved/modern facilities/production inputs to boost their output for greater profitability and standard of living. If the farmer has no other sources of income, it implied that the farmer cannot afford three square meal talk more of ensuring quality education/health care for his/her children.

Table 1: Result of Socioeconomic Characteristics of Smallholder Fluted Pumpkin Farmers

Socioeconomic Variables	Frequencies	Percentages	Mean
Age of farmer (Years)			**38.52**
≤30	20	33.3	
31-50	22	36.7	
≥50	18	30	
Sex			
Male	23	38.3	
Female	37	61.7	
Marital status			
Single	13	21.7	
Married	46	76.7	
Widowed	1	1.7	
Household size (person)			**5.17**
≤5	33	55	
6-10	24	40	
≥11	3	5	
Education level			
Primary	12	20	
Secondary	31	51.7	
Tertiary	17	28.3	
Farming experience (Years)			**5.47**
≤5	32	53.3	
6-10	23	38.4	
≥11	5	8.3	
Farm size (Hectares)			**0.54**
0.1-0.5	39	65	
0.6-1.0	10	16.7	
1.1-1.5	11	18.3	
Membership of cooperative			
Member	20	33.3	
Non member	40	66.7	
Frequency of extension contact			
No contact	43	71.7	
Once a week	1	1.7	
Once a month	16	26.7	
Annual farm income (₦)			**₦73,550**
≤50,000	29	48.3	
51,000-100,000	17	28.4	
101,000-150,000	9	15	
≥151,000	5	8.3	

Source: Field Survey, 2021

From Table 2, the total cost and total revenue of dry season smallholder fluted pumpkin farmers in the study area was ₦ 163,005/ha and ₦338,340/ha respectively. Net return was ₦ 175,335/ha. Benefit to cost ratio was 2.08, returns on investment was 1.08, and shepherd future of 48%. The benefit-cost ratios of 2.08 showed that every ₦1 invested on fluted pumpkin in the study area, return on investment was ₦ 1.08/ha. These results implied that dry season smallholder fluted pumpkin production in the area was profitable and shepherd future of 48% showed that the farmers were economically efficient. These findings agreed with Ayinde, Akerele, and Ojeniyi (2007); Idowu, Alimi, Tijani and Okobi (2007) who reported fluted pumpkin production as being profitable under existing production systems with an

average net income of $205.90/ha. The findings were also in consonance with Ogisi, Chukwuji and Okeke (2014) who reported benefit-cost ratio of $1 to $1.23 which implied that for every $1 invested, 23cents was realized and concluded that, fluted pumpkin production was profitable. The findings were also in line with Olowa and Olowa (2016) whose work reported net profit of ₦207,150; Shepherd-future of 28.5%; benefit-cost ratio of 3.5 for fluted pumpkin farming during dry season. Intensive fluted pumpkin farming during dry season therefore guarantees higher income among small scale fluted pumpkin farmers. This result disagreed with similar studies in literature (Gani and Omonona, 2009; Ayoola, 2014; Olowa and Olowa, 2016) and maintained that, farmers should not invest in irrigation for fluted pumpkin production and that, increased access to land, fertilizers and improved seeds would promote profitability and commercialization of fluted pumpkin enterprises in Nigeria. Akanni-John, Shaib-Rahim, Eniola, and Elesho (2020) also agreed with the findings of this work that fluted pumpkin production was a profitable venture with over 40% shepherd future. Nwauwa and Omonona (2010) maintained that fluted pumpkin production under irrigation system was more profitable compared to rain-fed system, thus agreeing with the findings of this work. The findings were also in consonance with Adebisi-Adelani, Olajide-Taiwo, Adeoye, Olajide-Taiwo (2011) who generally maintained that fluted pumpkin is the most important and extensively cultivated vegetable and income generating crops in many parts of Africa.

Table: 2 Results of Costs and Returns Analysis of Dry Season Smallholder Fluted Pumpkin Production

Inputs Used		**Quantity**	**Unit Cost (₦)**	**Total Cost (₦)**
Variable Inputs				
	Labour (Mandays)	32	1,500	48000
	Seed (Pods)	21	1,120	23,520
	Fertilizer (Kg)	15	500	7500
	Poultry manure (bag)	5	600	3,000
	Pesticides (litres)	2	3500	7,000
	Water (gallon)/ha	2500	10	25000
	Stakes (stands)	36	150	5,400
	Transportation	-	-	9000
Total Variable Cost (TVC)				**128,420**
Fixed Inputs				
	Land (Hectares)	0.5417	50,000	27,085
	Hoes	1	1,500	1,500
	Cutlasses	2	500	1,000
	Watering Can	2	500	1000
	Baskets	3	500	1500
	Bags	5	300	1500
	Harvesting knife	2	500	1000
Total Fixed Cost (TFC)				**34,585**
Total Cost (TC) = TVC + TFC				**163,005**
Revenue From;				
	Fluted Pumpkin Vines (Kg)	1007.8	300	302,340
	Fluted Pumpkin Pods (Pods)	18	2000	36,000
Total Revenue (TR)				**338,340**
Net Return (NR) = TR – TC				**175,335**
Benefit-Cost Ratio (BCR) = TR/TC				**2.08**
Return on Investment (ROI) = NR/TC				**1.08**
Shepherd Future (SF) = (TC/TR)100				**48%**

Source: Field Computation, 2021

From Table 3, the result of sources of water identified and analyzed showed that majority (55%) of the smallholder fluted pumpkin farmers use stream water for dry season vegetable production. From investigation, in the study area, there is a popular perennial stream called "Ibii" that has never dried in the dry season. The farmers within the axis enjoy mass production of fluted pumpkin and other vegetables during the dry season using the source of water. This

finding agreed with Obuobie (2003) who maintained that source of water or its quality is of little concern to farmers but what is important to them is its uninterrupted availability and that they do not have to pay for it. Other sources of water used in dry season production of fluted pumpkin were wastewater (26.7%), bore-hole (8.3%), well or dug-outs (5%), pond (3.3%), and river (1.7%) of the respondents respectively. Another significant proportion of irrigation water in the study area is wastewater. This finding also agreed with Obuobie (2003) who reported, on estimates that at least 20 million hectares of land in 50 countries are irrigated with raw or partially treated wastewater. Some percentages of the farmers patronize bore-hole owners at ₦10 per 25litres gallon, hence the researcher's standard for measuring water quantity and average cost in the study area.

Table 3: Sources of water for Dry Season Production of Fluted Pumpkin in the Study Area

Sources of Water	Frequency	Percentage
Bore-holes	5	8.3
Stream	33	55
Pond	2	3.3
River	1	1.7
Well (Dug-outs)	3	5
Wastewater	16	26.7
Modern Irrigation System	0	0
Total	**60**	**100**

Source: Field Survey, 2021

From Table 4, the factors affecting profitable fluted pumpkin production were classified under production, economic and managerial. The implication of this classification is to enable farmers, researchers, policy makers, extension workers, Government and non-Governmental organizations, know exactly where to come in. However, the factors that were classified as production constraints were inadequate improved varieties of seeds (0.518), pests and diseases (0.455), poor feeder roads (0.581) and poor implementation of government policies (0.4375). Also the economic constraints were high cost of inputs (0.526), instability of product prices (0.4655), high cost of transportation (0.4635) and inadequate credit facilities (0.5331). Furthermore, the managerial constraints were inadequate extension contact (0.5885), nature of land ownership (0.526), poor market information (0.563), Lack of irrigation facilities (0.518), poor storage facilities (0.4065) and lack of processing facilities (0.5162). These findings were in line with the findings of Nwibo and Okories (2013), who used same procedure to isolate and categorise agricultural constraints into production, economic and managerial and maintained that these constraints hinder production processes in their different categories.These findings agreed with Nwosu, Onyeneke and Okoli, (2012) whose work reported lack of credit facilities, lack of availability of inputs, pests and disease infestation, inadequate information about input and output prices, and poor road network respectively as constraints on profitable fluted pumpkin production. This was consistent with Onyebinama (2004) who reported that farm input markets face several constraints which range from accessibility and affordability of inputs owing to its high prices, though governments subsidizes the farm input but it always arrives very late and therefore leaves farmers at the mercy of open market traders. Nwachukwu (2008) reported that one of the major constraints facing smallholder farmers were lack of fund to actually plan and execute their agricultural undertakings. This result agreed also, with Swindell (2005) who reported that the produce of farmers face the problem of price fluctuations, as such produce are not sold at prices that would cover cost of production let alone leaving surplus to cover or pay for the efforts of the farmers. This finding is in agreement with the findings of Olowa and Olowa (2016) who identified the major constraints to increase production and processing as high cost of transportation, lack of capital and market uncertainty and the tedious operations of processing. The result of poor extension contact concurs to the finding of Unammah (2003) who reported that poor ratio of extension agent to farmers in most developing countries resulted in farmers not having access to improved technologies. Regarding nature of land ownership, this finding is consistent with findings of Spencer (2002) who stated that smallholder farmers in Nigeria have remained subsistent oriented due to inadequacy of resources as well as the system of land ownership, thus, need assistance to rise beyond subsistence level.The results agreed with Mustapha *et al.* (2016), FAO (2006) who reported pest and diseases, inadequate credit facilities and high interest rate, perishability of produce, water shortage and lack of ready market as major constraints on profitability of vegetable production. Okpeke and Adaigho (2016) agreed with this finding as they reported lack of access to credit facilities, high cost of transportation, lack of storage facilities, and scarcity of viable seeds as major

constraints, thus classifying seasonality in production, problem of land acquisition, price fluctuation, and pest and disease infestation as minor constraints in disagreement to this finding. Ogisi, *et al.* (2012) agreed with this finding that unpredictable market, high cost of labour, problem of storage and land acquisition, seed scarcity, lack of equipment and high cost of transportation were serious constraint to fluted pumpkin production. Goni, *et al.* (2013) generally agreed with the findings of this work that rain-fed agriculture is the most common practice in Nigeria as more than three quarters of the country's agricultural area is rain-fed and subsistence in nature and maintained that, rain-fed agriculture can no longer cope with the increasing food demand throughout the year as a result of growing population coupled with climate change. This made rain fed agriculture unreliable as well as unpredictable and therefore has to be supplemented with irrigation for effective agricultural production to be realized.

Table 4: Principal Component Analysis of Constraints affecting Profitable Fluted Pumpkin Production in the Study Area (n=60)

S/N	Constraints	Production	Economic	Managerial
1.	Inadequate improved varieties of seed	0.518	-0.216	0.0125
2.	High cost of inputs	-0.0925	0.526	0.0715
3.	Inadequate extension contact	0.036	0.0935	0.5885
4.	Nature of land ownership	0.043	0.052	0.526
5.	Pests and diseases	0.455	0.0145	0.194
6.	Instability of product prices	0.123	0.4655	-0.0128
7.	Poor market information	0.1332	-0.218	0.563
8.	Poor feeder road	0.581	0.0385	0.042
9.	High cost of transportation	0.152	0.4635	0.1255
10.	Poor implementation of Government policies	0.4375	-0.107	0.0325
11.	Lack of irrigation facilities	0.346	0.1362	0.518
12.	Inadequate credit facilities	0.214	0.5331	0.063
13.	Poor storage facilities	-0.192	0.2445	0.4065
14.	Lack of processing facilities	0.0698	0.349	0.5162

Source: Field Survey, 2021

CONCLUSION AND RECOMMENDATIONS

From the findings of the study:
The smallholder fluted pumpkin farmers in the area were still young and were majorly married females with sizeable households, had secondary education with few years of farming experience, small land holdings and majorly none member of cooperatives, with low frequency of extension contact and meagre annual farm income.
The benefit-cost ratios of 2.08 showed that for every ₦1 invested on fluted pumpkin production, return on investment was ₦1.08, which implied that dry season smallholder fluted pumpkin production was profitable and shepherd future 48% implied high economic efficiency for dry season smallholder fluted pumpkin production in the study area.

Based on the major findings of the study, the following recommendations were made:
Farmers are advised to join cooperative societies.
Extension agents in the study area should be encouraged by providing favourable conditions of service to promote quality extension service delivery.
Modern storage and processing facilities should be provided to reduce deterioration and losses of the produce.

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