COMPARATIVE ECONOMIC ANALYSIS OF WATERLEAF AND FLUTED PUMPKIN PRODUCTION IN BENIN METROPOLIS, EDO STATE, NIGERIA

BY

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BENIN CITY

JULY, 2021

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PROJECT SUBMITTED TO THE DEPARTMENT OFAGRICULTURAL ECONOMICS AND EXTENSION SERVICES,UNIVERSITY OF BENIN, BENIN CITYIN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF AGRICULTURE (OPTION: AGRICULTURAL ECONOMICS AND EXTENSION SERVICES)

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CERTIFICATION

This is to certify that this research work was carried out by **CHIWETA IYEH** with Matriculation Number **AGR1400058** in the Department of Agricultural Economics and Extension Services, Faculty of Agriculture, University of Benin, and that the research project was approved as adequate in scope and quality for the partial fulfillment of the award of the bachelor of Agriculture (B.Agric).

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Prof P.O Erhabor	**Dr. C .I Ada-Okungbowa**.
(Project supervisor)	(Ag. Head of Department)
Date: _____	**Date:_____**

DEDICATION

This project is dedicated to God ALMIGHTY, my sustenance and his overwhelming love towards me and also to my parents, MR&MRSIYEH

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Special thanks to God Almighty for loving me in a special way and blessing me with caring parents that is so unfailing throughout the course of my study.

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ABSTRACT

This study examined the comparative economic analysis of waterleaf and fluted pumpkin in Benin metropolis Edo State. Specifically, the study described the socio-economic characteristics of fluted pumpkin and waterleaf farmers in the study area, identified and compared the production operations of waterleaf and fluted pumpkin, determined and compared the profitability of waterleaf and fluted pumpkin production, examined and compared the factors affecting the production of waterleaf and fluted pumpkin and identified the constraints faced by farmers in the production of fluted pumpkin and waterleaf in the study area. Multistage sampling procedure involving the combination of purposive, and simple random sampling technique was used to sample a total of 90 respondents (39 for waterleaf and 51 for fluted pumpkin respondent). The data collected were analyzed using descriptive statistics, budgetary model, and multiple regression model and t- test. The results of the analysis showed the mean age of 52years for waterleaf and 53years for fluted pumpkin while 74.36% were female for waterleaf farmers and 84.31% were also female for fluted pumpkin farmers. The results also revealed that 56.41% had primary education for Waterleaf farmers and 58.82% for Fluted Pumpkin farmer and the highest form of education is primary education. Majority (82.05% for waterleaf and 90.20% for fluted pumpkin farmers) were married. The mean farming experience was 6 years while the average household size has a mean of 5 members per household. The study also revealed that fluted pumpkin

enterprise was more profitable than waterleaf enterprise with a net profit of ₦131,812.00 and ₦241,535.00 in the study area. The results of the multiple regression analysis for the factors that affect the production of waterleaf and fluted pumpkin production revealed a coefficient of determination (R^2) of 0.464 for waterleaf and of 0.659 for fluted pumpkin. The significant production constraints for waterleaf farmers were; ; Inadequate planting material, lack of improved variety, Inefficiency of crude implement, Pest and disease infestation, Poor storage, High cost of Transportation, Poor extension services, Inadequate credit facilities, High interest rate, Poor transport facilities While for fluted pumpkin farmers were; Inadequate planting material, Pest and disease infestation, Poor storage, High cost of Transportation, Poor extension services Low pricing of vegetables, Inadequate credit facilities, High interest rate, Poor transport facilities. From this study it was concluded that fluted pumpkin enterprise is more profitable when compared to waterleaf enterprise.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Vegetables are frequently becoming valuable as produce for native and foreign trades. They have a great ability to enhance the nutrition and the health of consumers as most are good sources of minerals, vitamins and proteins necessary for the appropriate functioning and growth of the human body (Wills, Barry, Doug and Daryl, 1998). In Nigeria, apart from under-nutrition and over-nutrition which currently constitute a double burden of disease, hidden hunger also constitutes a third burden. Vitamin A deficiency and Iron deficiency remain public health challenges in Nigeria particularly in the rural area due to low quality diets. This poor diet could be improved with readily available and accessible green leafy vegetables (Isibhakhomen, 2019).

Study has shown that fluted pumpkin is grown and cultivated among low land humid tropics of West Africa including Ghana and Sierra Leone (Bologi, 2012). Fluted pumpkin production remains established in Nigerian agriculture and forms an important condiment in the national diet (Ibekwe and Adesope, 2010). Alongside different food, production and consumption of fluted pumpkin is very important and serves as a source of great income for farmers. Fluted pumpkin

(*Telferia occidentalis)* is one of the top green vegetables in Nigeria. Due to its liquidity and nutrient it provides, it takes a very important place in the population's diet. The crop is often grown and consumed in the rural, urban and semi-urban areas in Nigeria. It is mainly produced by small scale farmers, who earn their living from it using limited farm inputs. Fluted pumpkin is the most important and extensively cultivated food and income generating crop in many parts of Africa (Adebisi-Adelani,Olajide-Taiwo, Adeoye and Olajide- Taiwo., 2011). On the other hand, Waterleaf (Talinum triangulare) is a non-conventional vegetable crop of the Portulacea family which originated from tropical Africa and is widely grown in West Africa, Asia, and South America (Schippers, 2000). Waterleaf as a vegetable has some inherent characteristics which makes it attractive to small scale farmers and consumers. Firstly, it is a short duration crop which is due for harvest between 35-45 days after planting (Rice, 1986). Secondly it is used as a softener when cooking fibrous vegetables such as Afang (Gnetum africanum), Atama (Heinsia crinata), and Fluted pumpkin (Telferia occidentalis), it is also a plant that is easily propagated by cuttings and seeds. (Ibeawuchi, 2007) noted that the leaves and young shoots are used to thicken sauce and it is consumed in large quantities in the southern part of Nigeria. Nutritionally, waterleaf has been proven to be high in crude-protein (22.1%), ash (33.98%), and crude fiber (11.12%), it also has some medicinal values in humans and acts as green forage for rabbit feed management (Ekpenyong, 1986; Aduku and Olukosi,

1990). In addition, waterleaf production provides a complementary source of income to small-scale farming households (Udoh, 2005). The demand for waterleaf is therefore increasing among the inhabitants of the country, thus widening the domestic demand and supply gap of the product.

1.2 Statement of the problem

Vegetables (fluted pumpkin and Waterleaf) are highly peutrifiable as they start to lose their quality shortly after harvest. Fluted pumpkin production has not been able to meet the domestic demand for its consumption regardless of its high nutritional, medical and economic value (Opadode and Adebayo, 2005). However threat to vegetable production may be attributed to several factors that are beyond the control of the producers. Biological processes of plant growth and climatic state inherent in agricultural production shocks (Godwin and Mishra, 2000; Holt and Chavas, 2002), such as harvest failure as a result of drought, frost, floods and other adverse climatic events; policy shocks (Dercon, 2002). Also a significant proportion of the farmers, mainly produce during the rainy season (Abua, 2004). This stipulates that both crops are hardly produced at off seasons under irrigated practices. The production technologies used in some planting and post planting operations are still poor. These groups of farmers have little access to the required farm input and lack required knowledge in processing and storage of crops, keeping of records as well as evaluation of the entire farming business. These

facts indicate that the levels of production by most farmers are still not satisfying. As a result of such problems faced by waterleaf and fluted pumpkin farmers, investors have been unable to know which of the enterprises is more profitable to invest in.

Therefore to analyse and compare the production of waterleaf and fluted pumpkin in Ovia North East, of Edo State, this case study seeks to answer the following questions:

1. What are the socio-economic features of waterleaf and fluted pumpkin farmers in the study area?
2. What are the specific production operations carried out by waterleaf and fluted pumpkin farmers in the study area?
3. Is the production of waterleaf and fluted pumpkin in the study area profitable and which of them is more profitable?
4. What are the factors influencing the profitable production of waterleaf and pumpkin?
5. What are the constraints faced by farmers of waterleaf and farmers fluted pumpkin?

1.3 Objectives of study

The main objective of this study is the comparative economic analysis of waterleaf and fluted pumpkin production in Ovia North East, Edo State of Nigeria. The specific objectives are to;

1. Describe and compare the socio-economic characteristics of fluted pumpkin and waterleaf farmers in the study area;
2. Estimate and compare specific production operation between fluted pumpkin production and waterleaf production in the study area;
3. Estimate and compare the profitability of waterleaf and fluted pumpkin production in the study area;
4. Examine and compare the factors affecting the production of water leaf and fluted pumpkin in the study area;
5. Identify and compare the constraints faced by farmers in the production of fluted pumpkin and waterleaf in the study area;

1.4 Justification for the study

Based on the researcher's knowledge, not much work has been done on the comparative economic analysis between waterleaf and fluted pumpkin in the study area. This study seeks to determine the factors affecting waterleaf and fluted pumpkin production and the profitability of both vegetables in the study area.

The findings of this study on the socio-economic characteristics of farmers involved in waterleaf and fluted pumpkin production will help farmers know how to adjust in their socio-economic characteristics in order to improve their effectiveness in production. Also the findings on costs, returns and profitability of waterleaf and fluted pumpkin production will help potential investors in making accurate estimate of the cost and profit of waterleaf and fluted pumpkin production in the study area and also to know if both enterprise is profitable, and which of the enterprise is more profitable to enable investors to know which enterprise to commit their resources to. More so, in determining the constraints faced by farmers in the production of waterleaf and fluted pumpkin will help the government to develop policies that will enhance the production of waterleaf and fluted pumpkin in the study area. Finally, this study will serve as a guide to other researchers who would like to explore more into the hidden possibilities in the production of waterleaf and fluted pumpkin as this study will educate the general public in knowing the productiveness obtained in venturing into waterleaf and fluted pumpkin production for a better living.

1.5 Hypothesis Testing

H_0: There is no significant difference between the profit earned by waterleaf and fluted pumpkin farmers.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction to Economic Analysis

An economic analysis is the study of economic systems. Its a systematic approach used to determine the optimum use of scarce resources, involving comparison of two or more alternatives achieving a specific objective under the assumptions and constraints. It takes into account the opportunity costs of resources employed and attempts to measure in monetary terms the private and social costs and benefits of a project to the community or economy (MBN, 2019).

2.2 Waterleaf as a crop

Waterleaf, Talinum triangulare is one of the most widely consumed vegetables in southern Nigeria (van Epenhuijesen, 1974). The valuable parts of the crop are the leaves and succulent stems (Rice et al., 1987). The cultivation of water leaf is an important occupation and source of income of some peasant housewives. However, in the western part of Nigeria, water leaf is largely regarded as a weed (Akobundu, 1984). (Schippers, 2000) stated that as the name triangular implies, it is best recognized by its triangulare peduncle. The Yorubas call it ‘gbure’ whereas the Igbos call it ‘mgborodi’, in Sierra Leone, it is referred to as ‘bologi’ while in Cameroon, it is called ‘elok-sup’ (Scippers,2000).

Waterleaf is a small glabrous herbaceous plant in growth habit and is well adapted to areas close to rivers and streams. The plant is cultivated during the raining season usually in a variety of habitats including roadsides, open fields and abandoned agricultural lands (Edet and Sunday, 2007). In the Southern part of Nigeria, where it is abundant, it is found growing in both wild and domesticated states (Williams et al., 1997). Seeds are mature (van Epenhuijsen, 1974). The flowers are deep pink and open only in the mornings. Each has two sepals with three dark green nerves. The flowers dry up and fall before the fruits are ripe. (Uzo and Peregrine, 1991) summarized the major biology of the crop and reported that it is a perennial, with the underground portion penetrating to grow again after the dry season.

According to (van Epenhuijsen, 1974), waterleaf is also drought tolerant and has the ability to ratoon in the following year with the early rains. It thrives well under a wide range of soil conditions, but does better in a well drained sandy loam soil rich in organic matter (Thompson et al., 1975).

2.2.1 Economic importance of waterleaf

Asiegbu (1984) who worked on *Telfairia occidentalis* reported that with the need for fresh vegetables at all times, sequential establishment over a period of time can be employed to extend the period of availability and harvest of certain vegetables. Waterleaf may be established in August or September so as to be

available for profitable sale in the dry season when vegetables are scarce. Propagation of the crop could be both by seeds and by cuttings, and according to van (Epenhuijsen, 1974) propagation by cutting is better.

The leaves and tender shoots/stems are used as browse plant for feeding livestock and may be used as a green manure crop. The young leaves and tenders shoots are also consumed as pot herbs (van Epenhuijsen, 1974).

Nutritionally, waterleaf has been proven to be high in crude-protein (22.1%), ash (33.98%), and crude fiber (11.12%). (Schippers, 2000) Suggested that the name waterleaf is most appropriate especially when it is realized that the moisture content of its leaves and young stems is as high as 94%. Once this crop is cooked it releases a lot of water and only a limited amount is available to be eaten. The vegetable is rather slimy and so it is suitable to be eaten with starchy staple foods such as yams, rice. It also has some medicinal values in humans and acts as green forage for rabbit and feed management (Ekpenyong, 1986; Aduku and Olukosi, 1990). Waterleaf is an excellent source of calcium and phosphorus, both of which are essential for healthy bones (Webmd, 2020). In fact, some research has shown taking calcium without phosphorus does very little for bone strength. The two elements appear to work together. They are especially good for helping women over 60 who are already suffering from osteoporosis (Webmd, 2020). They also help delay the onset of heart diseases and stroke. Waterleaf which is a good

source of vitamin A is essential for healthy eyes. Research indicates that vitamin A can slow the progression of retinal disease, reduce the risk of cataracts, and improve low-light vision. (Webmd).

Waterleaves are used in the preparation of slimy soups and stews to complement most times, a starch main dish, making it very valuable in the southern parts of Nigeria.

2.3 Fluted Pumpkin as a crop

Fluted pumpkin (*Telfairia occidentalis* Hook f.) belongs to the family Cucurbiaceae (Aregheore, 2007). Fluted pumpkin is one of the most important vegetables grown in southern Nigeria for human consumption.

The leading producers of fluted pumpkin in West Africa are Nigeria, Ghana and Sierra Leone (Nkang *et al*., 2003, Aregheore, 2007). However, there is no identifiable information on varieties of crop (Ajibade *et al*. 2006; FAO, 1992). It is a high climbing perennial crop with partial drought tolerance and penetrating root system (Egun, 2007). The plant requires a well-drained soil, some water and sunlight. The vines will climb to 1.5m. Flowers are white and dark purple. Sex of fluted pumpkin is difficult to identify until after 4 months after planting when it produces flowers, a major obstacle to its production (Anyim and Akoroda, 1983).The leaves are low in rude fibre but are rich source of folic acid, calcium,

zinc, potassium, cobalt, copper, iron, vitamin A, C and also have medicinal value (Ladeji*et al*. 1995, Ajibade*et al*. 2006). It does well in the heavy rainfall area and late plating does not favour *Telfairia* production because dry season will not allow extension of the period of crop production (Asiaba, 1982; Aseigba, 1985).

2.3.1 Economic importance of fluted pumpkin

Fluted pumpkin like other perennial plants has deep and extensive root systems that can hold soil to prevent erosion, dissolved nitrogen before it can contaminate ground and surface water, out compete weeds, therefore reducing the need for herbicides and help to mitigate global warming by carbon sequestration. *Telfairia*is a dioecious tropical vine grown in West Africa as leafy vegetables and for its edible seeds. The leaves have a high nutritional, medicinal and industrial value. It is rich in protein (29%), fat (18%) and minerals and vitamins (20%), (Akanbi*et al*. 2007). Nutritionally, leaves of *Telfairia*are rich in minerals antioxidants, vitamins such as thiamine, riboflavin, nicotinamide and ascorbic acid (Kayode and Kayode, 2011). Young leaves also possess a high level of magnesium (8.69 mg 100) and iron (3.60 mg), (Akwaowo*et al*., 2000) and due to its richness in iron, the leaves can prevent and eliminate anaemia (Ajibadeet, al. 2006). The oil in the seeds is non-drying and is used in soap making and in cooking. Pumpkin leaf has been reported to attenuate the testicular damage induced by quinine (Nwangwa, Mordi, Ebeye and Ojieh, 2007) and also found to

reduce lipid peroxidation thereby improving spermatogenesis (Emeka and Obidoa, 2009). The demand for fluted pumpkin has increased tremendously due to the diverse ways in which the crop is put to use, the low cost per unit of resource use in the production, short gestation period and quick returns on invested capital compared to other crop enterprises (Udoh and Akpan, 2007). According to Agbugba and Thompson (2015); *Telfaria occidentalis* ranks highest, in terms of net income among the notable and common tropical leafy vegetables grown in south-eastern Nigeria. AVRDC (2004) documented that vegetables are the most affordable and accessible sources of micronutrient and its production is a means of increasing and generating foreign exchange in Africa. Central Bank of Nigeria (CBN) (2004), documented that production of vegetables constituted about 4.6 percent of the total staple food production in Nigeria from 1970-2003.

2.4 Concept of production

In economics production is the act of creating output, a good or service which has value and contributes to the utility of individuals (Koller, Rackham and Krishna swamy, 2006). According to Ekanem and Iyoba (1999), production does not refer simply to the process of fabricating commodities, but also covers any activity concerned with the packaging, storage, transportation or marketing of these products as well as the rendering of personal and commercial services of all kinds. In short any activity which creates economic value represents production.

2.4.1 Production process

The whole system of activities leading to the fabrication of materials goods and service is known as the production process. In other words, it is combined system of activities by which various inputs are transformed into material goods and services per unit of time (Ekanem and Iyoba, 1999).

2.5 THEORITICAL FRAME WORK

2.5.1 Profitability Analysis

Profitability means ability to make profit from all the business activities of an organization, company, firm, or an enterprise. It shows how efficiently the management can make profit but using all the resources available in the market and measures the amount of profit earned (Wikipedia, n.d). Profitability analysis is a component of enterprise resources planning (ERP) that allows administrators to forecast the profitability of a proposal or optimize the profitability of an existing project. Profitability analysis can anticipate sales and profit potential specific to aspects of the market. In order to perform a profitability analysis, all costs of an organization have to be allocated to output to output units. This process is called costing. When the costs have been allocated, they can be deducted from the revenue per output unit (Financial application, n.d).

Profitability can be mathematically expressed as;

Profit = Revenue – Total Cost …… (1)

2.5.2 Net profit (NP)

Net profit refers to profits and loss incurred through the operations of a farm. A net profit statement (sometimes called a farm profit and loss statement) is a summary of income and expenses that occurs during a specified accounting period. Net income is the difference between total revenue and cost of production (Olukosi and Erhabor, 2006). The net profit is used to show the levels costs, returns and net profit that accrue to farmers involved in production. The technique emphasizes the (fixed and variable) costs and returns of any production enterprise. Olukosi and Ogungbile (1989) have examined two major categories of cost involved in crop production. These are fised and variable costs.

Fixed cost (FC) refers to those costs that do not vary with the level of production or output while Variable costs (VC) refers to those cost that vary with output. The total cost (TC) is the sum of total fixed cost (TFC) and total variable cost (TFC).

Net Profit (NP) = Total Revenue – Total Cost …….. (2)

Total Cost (TC) of Production = Total Variable Cost (TVC) + Total Fixed Cost (TFC) …… (3)

2.5.3 Depreciation method

All fixed assets except the value of land decreases with the passage of time. The value of these asset decrease each year. Such gradual reduction in the value of fixed assets for the purpose of earning revenue is called depreciation (Account learning, 2010). Depreciation is simply the pattern by which the cost is allocated to each of the periods involved in the service of life i.e the useful life of an asset to an enterprise, usually relating to the anticipated period of productive use of item.

2.5.4 Gross Margin

Gross margin is a required income statement entry that reflects total minus cost of goods sold. Gross margin is a company's profit before operating expenses, interest payments and taxes. Gross margin is also known as gross profit (Financial dictionary, n.d). Gross margin is a very useful tool in a situation where fixed capital is a negligible portion of the farm enterprise. (Olukosi and Erhabor, 2006). It can be calculated as follow;

Gross margin = Total Revenue – Total Variable Cost ……. (3)

2.5.5 Return on Investment (ROI)

The Return on Investment (ROI) is similar to benefit cost ratio (BCR) but compares the net benefit (total revenue less total cost) to cost. The Return on

Investment is a performance measure used to evaluate the efficiency if an investment or to compare the efficiency of a number of different investments. Return on Investment (ROI) measures the amount of return on an investment relative to the investment cost. To calculate Return on Investment; the profit of an investment divided by the costs of the investment, and the result is expressed as a percentage or a ratio. Return on investment is expressed mathematically as;

$$ROI = \frac{\text{Total Revenue} - \text{Total Cost}}{\text{Total Cost}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

A negative ROI means that the cost outweighs the benefits while ROI of 0 means the benefit equal the costs, a positive ROI means the benefits outweighs the cost.

2.5.6 Regression Analysis

Regression analysis is the estimation of the relationships among variables. It is used to analyze the relationships between a dependent variable and the independent variables.

It is expressed as explicitly as;

Linear function

$$Y = \beta_{\circ} + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e$$

It has a growing period of 5 to 6 weeks thus making it an advantage for the rural and peri-urban farmers in Nigeria to keep cultivating it two or more times on the same piece of land in a year (Adewole and Igberaese, 2011)

CHAPTER THREE

3.0 METHODOLOGY

3.1 Area of the study

This study was carried out in Ovia North East Local Government Areas (LGAs) of Edo State. Edo State is an inland State in Central Southern Nigeria, with Benin-city as its capital. It is bounded in the North and East by Kogi State, in the South by Delta State, and in the West by Ondo State. It is located between Longitudes 05° 04 East and 06° 43 East and Latitudes 05° 44 North and 07° 34 of the Greenwich. The State has a tropical climate characterized by two distinct conditions of wet and dry seasons. The wet season ranges from April to October with a brief fall in August. While the dry season ranges from November to March. The annual rainfall averages 250 cm near the coastal areas and 150 cm in the extreme northern part of the State. Temperature ranges from 22 36°C. The State covers an area of 17,802 sq km and it is divided into three agro-ecological zones with a total of eighteen local government areas. The major ethnic groups found in the State include; Benin, Esan, Estako, Igbanke, Afemai etc.

Edo state is noted for both crop and livestock production. The following are some of its crop products; Maize, rubber, cashew, cocoa, citrus, plantain, banana, Palm oil, rice, cassava, fluted pumpkin as well as water leaf. The State is also blessed

with precious stones like; quartz, amethyst, mica, dolomite, granite stone and lime stone used in cement production.

Ovia North East local government area has an area of 2,301 km² and a population of 153,849 at the 2006 census. Its headquarter is at Okada. Ovia North East consists of twelve (12) districts which includes, Adolor, Iguoshodin, Isiuwa, kokhuo, Oduna, Ofumn-Wengbe, Oghede, Okada, Oluku, Uhen, Uhiere, Utoka of which their major occupation is agriculture.

The scope of the study covers amaranth and fluted pumpkin farmers that engage in agricultural activities in the study area and it entails the socio economic characteristics of the farmers, the production operations, the profitability, the factors affecting production and the constraints faced by the farmers in the production of waterleaf and fluted pumpkin.

3.2 Sampling Technique

A multistage sampling procedure was used to select respondents for this study;

Stage1: Ovia North East was purposively chosen from the five local governments in Benin Metropolis as a result of high farming activities of water leaf and fluted pumpkin in the area.

Stage2: Simple random sampling technique was used to select eight (8) communities out of the list of communities obtained from the local government headquarter.

Stage3: Simple random sampling technique was used to select farmers from the list provided by Agricultural Development Programme of vegetable farmers in the area of Ovia North East local government (Adolor, Iguoshodin, Isiuwa, kokhuo, Oduna, Oluku, Oghede, Okada).

3.3 Data Collection

Primary data were used for this study. Primary data were obtained using structured questionnaire, which was designed to capture relevant data (Age, sex, marital status, education background, farming experience, household size, labour cost, credit facilities, interest rate, transport facilities, cost of vegetables, storage facilities, implements, planting materials and cultural practices) for this study.

3.4 Measurements of Variables and Unit

i. Labour was measured in mandays.

ii.Farm size was measured in hectares.

iii. Planting material (seed) Measured in kilogram.

iv. Chemical such as pesticide and herbicides used was measured in litres.

v. Quantity of fertilizers was measured in kilogram.

vi. Transportation was measured in Naira.

vii. Total fixed cost was measured using their depreciated values which will be calculated using straight line depreciation method.

viii. Total variable cost was measured in Naira.

ix. Output(Y) measured in kilogram.

3.5 Analytical Technique

A combination of analytical tools was used for this study. Such analytical tool includes; descriptive statistics (Mean, frequency distribution and percentages) and budgetary model (gross margin and net profit analysis), return on investment, multiple regression analysis and t-test.

Objective 1

Respondents' socio-economic characteristics were described using descriptive statistics such as mean, frequency distribution, and percentages.

Objective 2

Descriptive statistics was used to identify the production operations of water leaf and fluted pumpkin in the study area.

Objective 3

To estimate and compare the profitability of water leaf and fluted pumpkin production in the study area, gross margin and net profit analysis, return on naira invested and t-test were used.

TC = TFC + TVC……(1)

Where;

TC = Total cost (₦)

TFC = Total fixed cost (₦)

TVC = Total variable cost (₦)

Profitability will be determined for both enterprises using the Gross margin. Gross margin is expressed mathematically as;

GM = TR – TVC……(2)

Where;

GM = Gross margin (₦)

TR= Total Revenue (Unit price of output * Quantity of output) (₦)

TVC = Total variable cost (₦)

The variable costs include seeds, fertilizers, pesticides, herbicides, labour.

The net profit is expressed as:

NP = GM – TFC……..(3)

Where;

NP = Net profit (₦)

TFC = Total fixed cost (₦)

The fixed costs include the depreciation of farm tools such as cutlasses, hoes, spade, file, basket, bag, knife, hand gloves, wheel barrow, and rake, rent on farm land, . The straight line depreciation method, which assumes a constant rate of annual depreciation, was used to calculate the depreciation of farm tools.

This is given as;

Depreciation = (C - S)/N……..(4)

Where C = Cost of acquiring the fixed cost

S = Savage Value of the fixed asset

N = Expected life span of the fixed asset

Return on investment (ROI)

Return on investment (ROI) is expressed as;

$$ROI = \frac{\text{Net Profit}}{\text{Total Cost}} \quad \ldots\ldots\ldots\ldots\ldots\ldots(5)$$

t- test

This was used to compare the profitability of water leaf and fluted pumpkin enterprise. It is given as;

$$t = \frac{\bar{x_1} + \bar{x_2}}{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(6)$$

Where:

t = student t test

n_1= sample size of waterleaf farmers

n_2= sample size of fluted pumpkin producers

$\bar{x_1}$= sample mean of water leaf farmers

$\bar{x}_2$= sample mean of fluted pumpkin farmers

σ_1^2= sample variance of waterleaf farmers

σ_2^2= sample variance of fluted pumpkin farmers

Objective 4

Multiple regression analysis was used to express the relationship between response variables and predicator variables. The implicit form of the production function used is expressed as;

Y = F (X_1,X_2,X_3,X_4,X_5,X_6,X_7 + e_i)……(7)

Where;

Y= output of water leaf (kg)

X_1= planting materials (seeds in kg)

X_2= fertilizer (kg)

X_3= herbicides (kg)

X_4= pesticides (kg)

X_5= farm size (hectares)

X_6= family labour (mandays)

X_7= hired labour (mandays)

$\beta_{\circ}$= constant,

β_1 - β_7= coefficient of estimated parameters,

e_i= error term

This same model was also used for fluted pumpkin enterprise.

The following functional forms of production were evaluated and the equation with the best fit was selected as the lead equation.

It is expressed as explicitly as;

Linear function

$Y = \beta_{\circ} + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e$ ……(8)

Objective 5

To identify the constraints of water leaf and fluted pumpkin farmers.

The Likert scale was used to identify the constraints faced by water leaf and fluted pumpkin farmers in the study area. The scale is a five point scale i.e. the responses were grouped into 5. These include: Extremely serious (5), Serious (4), moderately serious (3), Least serious (2), and Not serious (1).

For a given constraint, the mean was computed by summing the score on each constraint and then dividing by the total number of response. A mean less than 3 indicates that the particular constraint is not serious. A mean equal to or greater than 3 means that the constraint is serious and was considered as the constraints faced by the water leaf and fluted pumpkin farmers in the study area.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Waterleaf and Fluted Pumpkin Farmers

4.1.1 Distribution of Respondents by Sex

The results represented in table 4.1 revealed that about 74.36% were female and 25.64% were male involved in waterleaf production and 84.31% were also female and 15.69% male involved in fluted pumpkin production. From the results, it can be inferred that women were more involved in fluted pumpkin production than in waterleaf in the study area. This could be as a result of the high demand for fluted pumpkin than waterleaf by consumers. Generally, it could be seen from the results that females engage more in vegetable farming, this is in agreement to the study by Odiaka and Akorada (2008) and Nwosu, Onyeneke and Okoli (2012) whose results showed that 78% and 96.70% of vegetable farmers were predominantly female.

Table 4.1: Distribution of respondents of sex

	Waterleaf		Fluted Pumpkin	
Sex	**Frequency**	**Percentages**	**Frequency**	**Percentages**
Male	10	25.64	8	15.69
Female	29	74.36	43	84.31
Total	39	100	51	100

Source: field survey, 2021

4.1.2 Distribution of Respondent by Age

The results shown in Table 4.2 reveal that respondents with the age bracket of 41-50 years with 35.90% for waterleaf and 35.29% for fluted pumpkin farmers are engaged in production having a mean age of 52years for waterleaf and 53years for fluted pumpkin. This shows that majority of the farmers within the age of 53years engaged in waterleaf production and fluted pumpkin. A probable reason for this could be that majority of the youths in the study area had migrated to urban areas to seek white collar jobs.

Table 4.2: Distribution of Respondents by Age

	Waterleaf		Fluted Pumpkin	
Age(years)	**Frequency**	**Percentage**	**Frequency**	**Percentages**
30 – 40	5	12.82	6	2.0
41 – 50	14	35.90	18	35.29
51 – 60	12	30.77	16	31.37
61– 70	8	20.51	11	21.57
Total	39	100	51	100
Mean	**52years**		**53years**	

Source: field survey, 2021.

4.1.3 Distribution of Respondents by Marital Status

The marital status of Waterleaf and Fluted Pumpkin farmers in the study area is represented in Table 4.3. The results showed that 10.26% were single, 82.05% were married, and 7.69% divorced for amaranth and 9.8% were single, 90.2% were married for Fluted Pumpkin. This means that Waterleaf and Fluted Pumpkin production in the study area were dominated by married men and women who might be depending on the proceeds for the sustenance of their families. This result is in line with the findings of Obinaju and Asa (2015) whose study showed that 72.2% of vegetable farmers were married.

Table 4.3: Distribution of Respondents by Marital Status

	Waterleaf		Fluted Pumpkin	
Marital status	**Frequency**	**Percentage**	**Frequency**	**Percentages**
Single	4	10.26	5	9.8
Married	32	82.05	46	90.2
Divorced	3	7.69	_	_
Total	39	100	51	100

Source: Field Survey, 2021.

4.1.4 Distribution of Respondents by Household Size

The results in Table 4.4 show that majority (53.85% of waterleaf and 50.98% of fluted pumpkin farmers) of the respondents had a household size between 1-4 persons. This implies that there is appreciable number of family labour supply to accomplish various farm operations. This corroborates the findings of (Obinaju and Asa, 2013) who opined that children in sub-saharan Africa tend to be of economic value and desirable for struggling parents.

Table 4.4 Distribution of Respondents by Family Size

	Waterleaf		Fluted Pumpkin	
Household Size	**Frequency**	**Percentage**	**Frequency**	**Percentages**
1 – 4	21	53.85	35	50.98
5 – 8	17	43.59	16	45.10
9 – 12	1	2.56	2	3.92
Total	39	100	51	100
Mean	**5**		**5**	

Source: Field Survey, 2021.

4.1.5 Distribution of Respondents by Educational Status

Table 4.5 shows that majority (56.41% for Waterleaf and 58.82% for Fluted Pumpkin) of the respondents had only primary education as their highest educational qualification. It can be inferred that fluted pumpkin farmers had a higher percentage of primary education than waterleaf farmers in the study area. Low literacy level of farmers could affect their choice of inputs, level of utilization of new technologies and innovation which could improve their productivity and also improve their standard of living. This is in line with the findings of Obinaju and Asa (2015), whose study showed that majority (48.9%) of vegetable farmers had only primary education and seconded by secondary education (20%).

Table 4.5: Distribution of Respondents by Educational Status

Educational status	Waterleaf Frequency	Percentage	Fluted Pumpkin Frequency	Percentage
No formal education	9	23.08	9	17.6
Primary education	22	56.41	30	58.82
Secondary education	5	12.82	6	11.76
NCE	1	2.56	4	7.84
OND	2	5.13	2	3.92
Total	39	100	51	100

Source: Field Survey, 2021.

4.1.6 Distribution of Respondents by Farming Experience

The results in Table 4.6 show the mean of the farming experience of the respondents in the study area to be about 6years for waterleaf and 6years for fluted pumpkin. The result means that the farmers had a good level of experience. Experience matters in the cultivation of vegetables (Waterleaf and Fluted Pumpkin) and those who have cultivated the vegetables over time have known the best cultural practice, appropriate chemicals (herbicides, pesticide, fertilizers), to use in order to boost output and facilitate production efficiency.

Table 4.6: Distribution of Respondents by Farming Experience

	Waterleaf		Fluted Pumpkin	
Farming Experience (years)	**Frequency**	**Percentages**	**Frequency**	**Percentages**
1 – 5	23	58.97	28	54.90
6 – 10	13	33.33	22	43.14
11 – 15	2	5.13	1	1.96
16 & above	1	2.56	0	0
Total	39	100	51	100
Mean	**6**		**6**	

Source: Field Survey, 2021.

4.2 Production Information (Waterleaf and Fluted Pumpkin)

4.2.1 Reasons for Vegetable Production

Table 4.7 shows that 69.23% of Waterleaf and 50.98% of Fluted Pumpkin respondents engaged in vegetable production for income, while about 30.77% of Waterleaf and 49.02% of Fluted Pumpkin respondents cultivated these crops for both income and consumption in the study area. A probable reason could be that farmers engage in the production of these vegetables because of the profit and also production could be all year round and the demand for them is very high. It

can be inferred that a higher proportion of farmers are engaged in waterleaf production than fluted pumpkin.

4.2.2 Source of Finance

As shown in Table 4.7, 94.87% of Waterleaf and 92.16% of Fluted Pumpkin farmers financed their production from their Personal savings, 5.13% and 7.84% respectively as gift from Relatives. A good reason for this could be that farmers in the study area had no reliable assets to obtain loan and could be denied access to loans due to high risks rate of agricultural production or due to high interest rate.

4.2.3 Type of Labour

As shown in Table 4.7, 41.03% of the respondents of Waterleaf and 52.94% of Fluted Pumpkin used family labour in production of both vegetables, while 28.21% Waterleaf and 21.57% of Fluted Pumpkin relied on hired labour and also 30.77% of Waterleaf and 25.49% of Fluted Pumpkin relied on both family and hired labour. This implies that cultivation and tending of the farm is done mainly by the farmer and members of his household.

4.2.4 Land Acquisition

Table 4.7 shows that majority (46.2%) of Waterleaf and (31.4%) of Fluted Pumpkin respondents in the study area acquired their land by Lease. From the result more waterleaf farmers acquire their land by lease than fluted pumpkin

farmers in the study area. A probable reason could be that farmers in the study area were not land owners and had to lease land in order to cultivate crops.

4.2.5 Source of Seed

Table 4.7 shows that majority (100%) of Waterleaf and (94.12%) of Fluted Pumpkin respondents obtained their seeds from open market and about 5.88% of Fluted pumpkin respondents purchased their seeds from research institute. From the result a larger proportion of waterleaf farmers purchased seeds from open market than fluted pumpkin farmers. This could be as a result of the illiteracy rate among rural farmers and unawareness of improved seeds and inaccessibility to such improved variety of seeds.

Table 4.7: Production Information

Variables	Description	Waterleaf =39 Frequency	Percentage	Fluted Pumpkin = 51 Frequency	Percentage
Reasons for business	Income	27	69.23	26	50.98
	consumption	-	-	-	-
	consumption and income	12	30.8	25	49.0
Source of financial capital	Personal savings	37	94.87	47	92.16
	Gift from relatives	2	5.1	4	7.8
Source of labour	Family labour	16	41.0	27	52.9
	Hired labour	11	30.77	13	25.49
	Both Hired and family labour	12	30.8	11	21.6
Source of farm land	Lease	18	46.2	16	31.4
	Inheritance/family land	14	35.9	24	47.1
	Communal land	4	10.3	10	19.6
	Purchase	3	7.7	1	2.0
Source seed	Government				
	Research institute	-	-	3	5.88
	Open market	39	100.0	48	94.12

Source: Field survey, 2021.

4.3 Production Operations

4.3.1 Land Preparation method

Table 4.8 shows that 38.5% of Waterleaf and 62.7% of Fluted Pumpkin respondents in the study area ridged their land before planting while 61.5% of Waterleaf and 37.3% of Fluted Pumpkin respondents planted on flat cleared land without ridging. A probable reason could be as a result of the tedious work done to construct ridges. From the result it can be inferred that more fluted pumpkin farmers planted on flat cleared ground than amaranth farmers in the study area.

4.3.2 Fertilizer Usage

Table 4.8 shows that 64.5% of Waterleeaf and 68.6% of Fluted Pumpkin respondent in the study area used fertilizer while 35.5% and 31.4% did not use fertilizer. This could be that the farmers could afford the cost fertilizer in the study area. Also from the result fluted pumpkin farmers used more fertilizers than amaranth farmers.

4.3.3 Type of Fertilizer Utilized

Table 4.8 shows that 61.3% of Waterleaf and 58.8% of Fluted Pumpkin respondent used inorganic fertilizer, while 16.1% and 29.4% used organic fertilizer and 22.6% and 11.8% did not use fertilizer. The higher percentages of respondent that used fertilizer could be as a result of the convenience in

application when compared to organic fertilizer application which has offensive smell. From the results more amaranth farmers used inorganic fertilizer than fluted pumpkin farmers in the study area.

4.3.4 Cropping System Practiced

Table 4.8 reveals that 87.2% of Waterleaf and 90.2% of Fluted Pumpkin respondent in the study area practiced mixed cropping while 12.8% and 9.8% practiced mono cropping system. This result is in line with the findings of Ogisi, Begho and Ewolor (2014) whose study showed that about 95% practiced mixed cropping. This is because the farmers wanted to utilize the land and maximize profit.

4.3.5 Crops Intercropped

Table 4.8 shows that majority of the respondent in the study area intercropped waterleaf and fluted pumpkin with maize. A probable reason could be that maize is an annual crop that does not utilize too much nutrient from the soil and also the demand for maize is high and maize is generally profitable. From the results more fluted pumpkin farmers intercropped maize with fluted pumpkin than waterleaf farmers in the study area.

4.3.6 Method of Weed Control

Table 4.8 shows 82.1% of Waterleaf and 78.4% of Fluted Pumpkin respondent managed weed manually with the use of crude implement such as cutlass and hoes. A probable reason for this is that chemicals could be detrimental to the production of these vegetable as it could contaminate the leaves if not properly applied. From the results more waterlef farmer's controls weed manually than fluted pumpkin farmers in the study area.

Table 4.8: Production operation

Production operations	Description	Waterleaf Frequency	Percentage	Fluted Pumpkin Frequency	Percentage
Land preparation	Ridging	15	38.5	32	62.7
	Planting on flat cleared land	24	61.5	19	37.3
Fertilizer usage	Yes	21	64.5	35	68.6
	No	11	35.5	16	31.4
Type of fertilizer used	Inorganic	19	61.3	30	58.8
	Organic	5	16.1	15	29.4
	None	7	22.6	6	11.8
Cropping system	Mono Cropping	5	12.8	5	9.8
	Mixed Cropping	34	87.2	46	90.2
Crops intercropped	Pepper	4	10.3	1	2
	Maize	15	38.5	20	39.2
	Groundnut	2	5.1	5	9.8
	Yam	8	20.5	15	29.4
	Cassava	10	25.6	10	19.6
Weed control	Manual	32	82.1	40	78.4
	Chemical	5	12.8	8	15.7
	Both	2	5.1	3	5.9

Source: field survey, 2021.

4.4 Costs and Returns of Vegetable Production (Waterleaf and Fluted Pumpkin)

The cost and returns of waterleaf and fluted pumpkin production in the study area are presented in Table 4.9. For waterleaf production the results showed the total cost of ₦44,863.64 per ha per production circle. Out of this, 33,317 accounted for total variable cost and 11,546 accounted for the total fixed cost per hectare. The total revenue of waterleaf production in the study area was found to be ₦176,675.00 for the production circle. The gross margin was found to be ₦143,358.00 after total deduction of the total variable cost from the total revenue. The net profit computed was ₦131,812.00 after the deduction of the total cost from the total revenue. The ROI of 2.94 implies that for every 1 naira that was invested in waterleaf production a return profit of 2 naira 94 kobo was realized.

The results further showed that the total cost of fluted pumpkin production was ₦52,737per ha per production circle. Out of this, 39,795.00 accounted for total variable costs and 12,942.00 accounted for the total fixed cost per hectare. The total revenue of fluted pumpkin production in the study area was found to be ₦ 294,272.00 for the production circle. The gross margin was found to be ₦254,477.00 and the net profit computed was ₦241,535.00. The ROI of 4.58 implies that for every one naira that was invested in fluted pumpkin production a return profit of 4 naira 58 kobo was realized.

From the results, it can be inferred that fluted pumpkin production was more profitable than waterleaf in the study area. A probable reason could be as a result of high demand for fluted pumpkin both in off and on season.

TABLE 4.9: Cost and Return of Waterleaf and Fluted Pumpkin per ha

Category	Waterleaf Mean	Pumpkin Mean
VARIABLE COST		
Seed cost	1,876.00	6,666.00
Fertilizer cost	6,783.00	9,591.00
Herbicide cost	4,893.00	5,611.00
Pesticide cost	7000.00	4,167.00
Transport cost	750.00	847.00
Market charges	385.00	411.00
Labour cost (hired)	5,792.00	5,588.00
Labour cost (family)	5,838.00	6,914.00
TVC	33,317.00	39,795.00
FIXED COST		
Depreciation (total)	2,649.00	2,866.00
Cost of Land rent/ha	8,897.00	10,076.00
TFC	11,546.00	12,942.00
REVENUES		
Unit price bundle	**955.00**	**986.00**
Quantity harvested	**185.00**	**304.00**
TR	**176,675.00**	**294,272.00**
GM	**143,358.00**	**254,477.00**
NI	**131,812.00**	**341,535.00**
ROI	**2.94**	**4.58**

Difference is significant at 5%, (t=2.95, df=88, prob<0.01)

Source: Field survey, 2021.

4.5 T - test

The results from the analysis shown in table 4.10 using the t-test hypothesis testing, the mean gotten for waterleaf and fluted pumpkin were 131,812.00 and 241,535.00 respectively, the result showed that there is a significant difference between the profit of waterleaf and fluted pumpkin enterprise at 5% level of significance. This means the result of fluted pumpkin enterprise this is more profitable than waterleaf enterprise.

TABLE 4.10: Hypothesis testing for the profit of Waterleaf and Fluted Pumpkin Production

	Waterleaf	*Fluted pumpkin*
Mean	131,812.00	241,535.00
Standard deviation	95320.033	187378.737
Observations	39	51
Standard error mean	15263.421	26238.271

Source: Field survey, 2021.

5% level of significance

4.6 Regression Analysis: Effect of Production Factors on Waterleaf Production

The results of the regression analysis on the relationship between the dependent and independent variables are shown in Table 4.11 for Waterleaf production. Linear function was used, it gave a multiple coefficient of determination (R^2) of 0.464 (with the adjusted R^2 of 0.343) which implies that the independent variables; (X_1) seed cost, (X_2) fertilizer cost, (X_3) herbicide cost, (X_4) pesticide cost, (X_5) labour cost, (X_6) family labour, (X_7) hired labour used in the model explained about 43% of variation in the output of waterleaf (Y) produced and 57% could be accounted for by the error term. The parameter estimates indicated that planting materials, fertilizer, herbicides, pesticides, farm size, family labour, hired labour were positively correlated with the farmers output, implying that an increase in the planting materials, fertilizer, herbicides, pesticides, farm size, family labour and hired labour will lead to an increase in the production of waterleaf which will also lead to an increase in profit, and only family labour is significant at 5% levels of significance.

Table 4.11; Multiple regression analysis for the factors that affect production of waterleaf production

	B	Std. Error	T value	Prob. Level
(Constant)	50.368	43.144	1.167	0.252
Seed cost	0.011	0.019	.562	0.578
Fertilizer cost	0.001	0.004	.177	0.860
Herbicide cost	0.010	0.007	1.456	0.155
Pesticide cost	0.026	0.015	1.787	0.084
Labour cost (Hired)	0.002	0.004	0.559	0.580
Labour cost (Family)*	0.010	0.004	2.308	0.028
Plot Size (ha)	16.100	38.307	0.420	0.677

R Square .464

Adjusted R Square .343

Std. Error of the Estimate 82.829

Significant at 5%

The results of the regression analysis on the relationship between the dependent and independent variables are shown in Table 4.12 for Fluted Pumpkin production. Linear function gave the equation with the best fit and was chosen as the lead

equation. The equation gave a multiple coefficient of determination (R^2) 0.659 of (with the adjusted R^2 0.604 of) which implies that the independent variables; (X_1) seed cost, (X_2) fertilizer cost, (X_3) herbicide cost, (X_4) pesticide cost, (X_5) plot size, (X_6) family labour, (X_7) hired labour used in the model explained about 20% of variation in the output of fluted pumpkin (Y) produced and 80% could be accounted for by the error term. The parameter estimates indicated that farm size, family labour and hired labour were positively correlated with the farmers output. Implying that an increase in the farm size, family labour and hired labour will lead to an increase in the production of fluted pumpkin which will also lead to an increase in profit but not statistically significant at 5% and 5% levels of significance this may be due to errors when collecting data. But the negative correlation that exist between output, planting material, fertilizers, herbicides and pesticides lead to a decrease in output but pesticide was statistically significant at 10%. This implies that an increase in planting material (seeds), fertilizers, herbicides and pesticides may not necessarily lead to an increase in output of fluted pumpkin production but a decrease in the output.

Table 4.12; multiple regression analysis for the factors that affect production of fluted pumpkin production

	Unstandardized Coefficients			Prob.
	B	Std. Error	T value	Level
(Constant)	22.920	60.398	.379	0.706
Seed cost	0.007	0.008	0.924	0.361
Fertilier cost	-0.005	0.003	1.531	0.133
Herbicide cost	0.004	0.009	0.470	0.641
Pesticide cost*	0.045	0.021	2.149	0.037
Labour cost (Hired)	0.007	0.007	0.990	0.328
Labour cost (Family)	0.002	0.006	0.367	0.715
Plot Size (ha)*	159.637	460.067	3.465	0.001

R Square .659

Adjusted R Square .604

Std. Error of

the Estimate 132.547

Significant at 5%

Source: Field survey, 2021.

4.6 Constraints of the Respondents

The production constraints confronting the waterleaf and fluted pumpkin farmers in their production are presented in Table 4.13. Here constraints with the mean score greater than or equal to 3 are regarded as serious or significant constraints while those with the mean score less than 3 are unserious or insignificant constraints. Serious constraints faced by waterleaf respondents were; Inadequate planting material, lack of improved variety, Inefficiency of crude implement, Pest and disease infestation, Poor storage, High cost of Transportation, Inadequate credit facilities, High interest rate, Poor transport facilities. And the serious constraints faced by fluted pumpkin farmers were; Inadequate planting material, Pest and disease infestation, Poor storage, High cost of Transportation, Low pricing of vegetables, Inadequate credit facilities, High interest rate, Poor transport facilities. While constraints such as High cost of labour, Poor extension services, Low pricing of vegetables, were unserious for waterleaf and constraints such as lack of improved variety, Inefficiency of crude implement, High cost of labour, Poor extension services, were unserious for fluted pumpkin.

Table 4.13: Constraints of Waterleaf and Fluted Pumpkin Respondents

	Water leaf		Pumpkin	
	Mean	SD	Mean	SD
Low level of education	4.41	.9	3.73	1.4
poor cultural practice	3.31	.6	2.86	.9
inadequate planting materials	3.32	.7	2.75	1.0
lack of improved	4.10	.6	3.63	.8
Inefficiency	3.51	.6	3.16	.8
pest and disease	2.69	.8	2.88	1.1
poor storage	4.67	.7	4.43	1.0
high cost of labour	2.67	1.0	2.76	1.0
high cost of transport	2.82	1.1	3.08	1.2
poor extension services	4.77	.7	4.75	.7
low pricing of vegetables	3.79	.7	3.92	.7
inadequate credit	4.69	.6	4.51	.9
high interest rate	1.77	1.1	1.65	.9
poor transport facilities	4.21	1.2	4.04	1.3

Source: field survey, 2021

Mean score of 3.0 is the benchmark

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

The study examined comparatively the economic analysis of Waterleaf and Fluted Pumpkin production in Benin Metropolis, Edo State, Nigeria. It specifically identified and described the socio-economic characteristics of waterleaf and fluted pumpkin farmers in the study area. Analytical tools such as descriptive statistics (Mean, frequency distribution and percentages) and budgetary model (gross margin and net profit analysis), return on investment, multiple regression analysis, and t- test were used to determine the profitability, examine the socio-economic characteristics identify and compare the production operation.

The study showed that most of the farmers in the study area were females (74.36% for waterleaf and 84.31% for fluted pumpkin farmers) and mean age of farmers were 52years for waterleaf and 53years for fluted pumpkin. Majority of the farmers in the study area were producing at a small scale with an average farm size of 1 ha. Majority of the respondent were married (82.95% for waterleaf and 90.20% for fluted pumpkin farmers). The study revealed that 56.41% of waterleaf farmers and 58.82% of fluted pumpkin farmers were primarily educated, and only 23.08% of waterleaf and 17.65% of fluted pumpkin farmers lack primary

education. The study revealed a household size of the entire respondent to be 5 for waterleaf and 5 for fluted pumpkin. The study also showed that majority of the respondent have a farming experience of 1 to 5 years for the entire respondent.

Waterleaf and fluted pumpkin production in the study area was determined to be profitable as the estimated gross margin for waterleaf and fluted pumpkin farmers were ₦143,358.00 and ₦254,477.00 respectively.

The total revenue from waterleaf and fluted pumpkin production was ₦176,675.00 and ₦294,272.00. The estimated net profit of **₦131,812.00** and **₦241,535.00** for waterleaf and fluted pumpkin production. The study showed that there is a significant difference between the profit of waterleaf farmers and fluted pumpkin farmers when analyzed with t – test.

The findings showed that among the examined constraints Inadequate credit facilities, Poor transport facilities, High cost of Transportation, Inadequate planting material, Pest and disease infestation, High interest rate, Poor storage, Inefficiency of crude implement, lack of improved variety constituted a serious constraints to waterleaf farmers. However the findings also revealed that Inadequate credit facilities, Low pricing of vegetables, Poor extension services, Poor storage, High cost of labour, Inadequate planting material, Pest and disease infestation were also considered as serious constraints faced by fluted pumpkin farmers in the study area.

5.2 Conclusion

The study revealed that the production of waterleaf had a net profit of ₦131,812.00 and ₦241,535.00 for fluted pumpkin production respectively. Based on the findings of this study it was concluded that fluted pumpkin enterprise is more profitable than waterleaf enterprise.

5.3 Recommendations

- Policies that enhance increase in the scale of production of farmers should be put in place.
- Loans should be provided by government to farmers in order to increase scale of production.
- Government should ensure that inputs such as seeds, fertilizers, pesticides should get to the farmers on time so that they could be efficient in production.
- The study also recommends that government should provide platforms for training on new innovation practices for farmers to adopt to improve production.
- Finally the study also recommends that government should employ extension agent to farmers and make land available to increase scale of production.

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RESEARCH QUESTIONNAIRE
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION SERVICE
UNIVERSITY OF BENIN, BENIN CITY,
EDO STATE, NIGERIA.
QUESTIONNAIRE FOR FLUTED PUMPKIN AND WATERLEAF FARMERS IN BENIN METROPOLIS OF EDO STATE, NIGERIA

Dear Respondent,
My name is IYEHEMMANUELCHIWETA a final year student of the above named University carrying out a research on the topic 'COMPARATIVE ECONOMIC ANALYSIS OF WATERLEAF AND FLUTED PUMPKIN PRODUCTION. Please kindly answer the questions as accurately as possible so as to ensure reliable data for this research. Your honest response will aid the validity of this study and whatever information you give will be treated with utmost confidentiality.
Thanks for your anticipated cooperation.

INSTRUCTION: Please tick and write where applicable.

Which of the following plant do you grow?

Pumpkin ( ) Waterleaf ( ) Both ( )

SECTION A: SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

1. Sex: (a) Male [ ] (b) Female [ ]
2. Age: ……
3. Marital status: (a) Single [ ] (b) Married [ ] (c) Divorced [ ]
4. Household size (number): …….
5. Educational status: (a) Non-formal Education [ ] (b) Primary Education [ ] (c) Secondary Education [ ] (d) NCE [ ] (e) OND [ ] (f) BSC[ ]
6. Farming experience (in years): …….

SECTION B: PRODUCTION INFORMATION

7. Why did you venture into this business? (a) Income [ ] (b) Consumption [ ] (c) others [ ]
8. What are the sources of your financial capital: (a) Personal savings [ ] (b) Cooperative society [ ] (c) Money lender [ ] (d) Commercial bank [ ] (e) Gift from relatives [ ] (f) Nigeria Agricultural Cooperative and Rural Development Bank [ ] (g) Micro Finance Bank [ ] (h) others (please specify)……
9. What type of labour do you use on your farm: (a) Family labour [ ] (b) Hired labour [ ] (c) Both [ ]

10. If you borrowed, how much did you borrow to finance your last production? (Please fill with respect to the source indicated in question in 8.

SOURCE OF LOAN	**AMOUNT (₦)**	**INTEREST RATE (%)**
Commercial bank		
Nigeria Agricultural Cooperative and Rural Development Bank		
Cooperative Societies		
Micro Finance Bank		
Money lenders		
Others (please specify)		

11. Have you been visited by an extension agent? Yes ( ) No ( )
12. If yes, how many times were you visited in the last one year? .....
13. How many farm plots do you have? Amaranth ……, fluted pumpkin ……

Please indicate the size in the table below:

PLOT NO.	**PLOT SIZE (Ha)**	
	Waterleaf	**Fluted pumpkin**
1		
2		
3		
Total		

14. What does it cost to rent one hectare of land per season in your area of Production? ₦.....
15. How did you acquire your land? .....
16. What are your source of farm inputs (a) Agricultural development program (ADP) [ ] (b) Federal Ministry of Agricultural (c) local markets [ ] (d) International Institute of Tropical Agriculture (IITA) [ ] (e) others(please specify)……
17. Land preparation (a) ridging [ ] (b) planting on flat cleared ground [ ]
18. Cropping system (a) mono cropping [ ] (b) mixed cropping [ ]
19. Crops intercropped (a) pepper [ ] (b) maize [ ] (c) groundnut [ ]
20. Weed control (a) manual [ ] (b) chemical [ ] (c) both [ ]

21. Fertilizer usage (a) yes [ ] (b) no [ ]
22. Fertilizer type (a) organic [ ] (b) inorganic [ ] (c) none [ ]

FIXED INPUTS

Equipment	**Number Owned**	**Unit cost(₦)**	**Number rented**	**Unit cost(₦)**	**Total cost (₦)**	**Useful life**	**Annual depreciation**
Cutlass							
Hoe							
Spade							
File							
Basket							
Bag							
Knife							
Hand gloves							
Wheel barrows							
Rake							
Knapsack sprayer							

VARIABLE COSTS

(i) What quantity of the following did you use for last production season?

	WATERLEAF			**FLUTED PUMPKIN**		
INPUTES	QUANTITY (KG)	COST/ UNIT	TOTAL COST(₦)	QUANTITY	COST/ UNIT	TOTAL COST(₦)
Seeds						
Fertilizer						
Herbicides						
Pesticides						

(ii) How much does it cost to transport the entire product harvested? (a) ₦500 – ₦1000[ ] (b) ₦1000 – ₦5000[ ] (c) ₦5000 – ₦10,000[ ] (d) ₦10,000 and above[ ]

(iii) Do you pay any form of market charges (tax or market revenue) Yes ( ) No ( )
If yes, what is the amount? (a) ₦200 - ₦500[ ] (b) ₦500 - ₦1000[ ] (c) ₦1000 - ₦2000[ ] (d) ₦2000 and above

LABOUR COST

(i) What quantity and cost of labour did you use for last production season?

Waterleaf

	HIRED LABOUR			**FAMILY LABOUR**		
Work type	No. of mandays worked	Cost per manday(₦)	Total cost(₦)	No. of mandays worked	Cost per manday(₦)	Total cost(₦)
Land clearing						
Planting						
Fertilizer application						
Herbicide application						
Pesticide application						
Weeding						
Harvesting						

FlutedPumpkin

	HIRED LABOUR			**FAMILY LABOUR**		
Work type	No. of mandays worked	Cost per manday(₦)	Total cost(₦)	No. of mandays worked	Cost per manday(₦)	Total cost(₦)
Land clearing						
Planting						
Fertilizer application						
Herbicide application						

Pesticide application						
Weeding						
Harvesting						

REVENUE/RETURN
WATERLEAF

Quantity harvested (bundle) per day	No. of harvest per week	Unit price of bundle(₦)	Quantity harvested (bundle) per month	No. of months of harvest per year	Weight of bundle (kg)

FLUTED PUMPKIN

Quantity harvested (bundle) per day	No. of harvest per week	Unit price of bundle(₦)	Quantity harvested (bundle) per month	No. of months of harvest per year	Weight of bundle (kg)

SECTION C: PRODUCTION CONSTRAINTS

Please tick the intensity of each of the constraints in the production of waterleaf and fluted pumpkin. Values of constraints Very Serious (VS) = 5, Serious(S) = 4, Moderately Serious (MS) = 3, Least Serious (LS) = 2, and Not Serious (NS) = 1

S/N	CONSTRAINTS	VS	S	MS	LS	NS
1	Low level of education					
2	Poor cultural practices					
3	Inadequate planting material					
4	lack of improved variety					
5	Inefficiency of crude implement					
6	Pest and disease infestation					
7	Poor storage					
8	High cost of labour					
9	High cost of Transportation					
10	Poor extension services					
11	Low pricing of vegetables					

12	Inadequate credit facilities					
13	High interest rate					
14	Poor transport facilities					
15	Others(please specify)					