ECONOMIC ANALYSIS OF FRUITED PUMPKIN (Telfaria occidental alis Hook F.) PRODUCTION IN GUIUEA SAVANNAH, NIGERIA

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Abstract – Fluted pumpkin (Telfairia occidentalis, Hook F.) is one of the most important vegetables grown in Nigeria. It is generally regarded as a leaf and seed vegetable. The leaf has high nutritional, medicinal and industrial values being rich in protein 29%, fat 18%, minerals and vitamins 20% In the present study, an attempt was made to calculate the cost of cultivation, find out resource use efficiency and to find out constraints in production and marketing of fluted pumpkin in the study area. The study area selected was Gassol, Jalingo and Donga. A multi-stage sampling method involving a combination of purposive and random sampling procedures was employed in drawing up the sample block, villages and farmers for collecting primary data. One hundred and fifty farmers (60 marginal, 39 small and 51 large) were selected at random by proportional probability sampling technique. In the study Maximum likelihood Estimation (MLE) technique was used in stochastic frontier production for Total fixed cost for marginal, small and medium farmer are N7836.43, 7190.44 and 7181.91respectively .The benefit cost ratio is Maximum in case of medium farmers with at 2.9:1, followed by small farm (2.4:1) and marginal farmers (1.5:1). The gross returns from a hectare land are highest in case of medium farm with N73869.53 followed by marginal (59251.87) and small (57359.88). A significant difference indicates sub-optimal allocation of resource. Labour, fertilizer and machine are not efficiently utilized in the study area. The study suggests that there should be a well-built infrastructural provision and efficient use of inputs with strong price regulating market organization without malpractices which would show the way to a well-built pumpkin production system.

Keywords: Fluted Pumpkin, Profitability, Return on Investment, Fixed cost, Variable cost.

1.0 INTRODUCTION

Fluted Pumpkin (*Telfairia occidentalis*, Hook F.) is one of the oldest food crop known to man and it is wildly cultivated with many varieties. It is generally regarded as a leaf and seed vegetable. The leaf has high nutritional, medicinal and industrial values being rich in protein 29%, fat 18%, minerals and vitamins 20% (Ndor, E., Dauda S. N., and Garba, M. N., 2013). Alade (2000) stated squashes (sugar pumpkin) originated in new word and were introduced to the conquistadors by the early native American who in turn carried those food plants back to Europe Pumpkin is large round vegetable with think orange skin that the seed can be dried and eaten and the soft flesh cooked as a vegetable. It is a dicotyledonous plant of the family of cucurbilaceae known as cucurbita pepo with botanical name *Telfaria Occidentalis*. Pumpkin is known to be an American dish served at thanksgiving. The cultivation of the plant has at most three stages which are land preparation, planting, and harvesting. Obinaju (2013) has it that squashes and pumpkin may be grown in the same way as ridge cucumbers or marrows. Energy malnutrition (PEM) is rarely seen among the dwellers where *Telfairia occidentalis* is consumed in large proportion daily (Dike, 2010). The use of *Telfairia occidentalis* in reproductive and fertility is gaining grounds. Nwangwa, Mordi, Ebeye and Ojieh (2007) showed that *Telfairia occidentalis* has the potential to regenerate testicular damage and increase spermatogenesis. *Telfairia occidentalis* is high in anti-oxidant and free radical scavenger properties and that may contribute to why many use the leave extract in oxidative damage conditions such as tonic by women that have just given birth; its high iron content assists in the replenishment of lost blood; being used for treatment of anaemia, chronic fatigue and diabetes (Alada, 2000; Obinaju 2015). The blood schizontocidal activity of the root of *Telfairia occidentalis* is comparable to that of chloroquine and also the leaf extract alone is useful in the management of hyper chelsterolaemia, liver problems and impaired immune system (Eseyin, Igboasoiyi, Oforah, Ching and Okoli, 2005a).

The plants occupy a good deal of space so plenty of room should be allowed. These plants are raised in glass or flames from seed sown in pots in April or May with three seeds in a pot and the weakest is thinned. The plant after germination grows up to occupy a given space with roots, shoots, leaves, flowers and fruits. Pumpkin does

not have a specific duration for growth when analyzing its function. Harvesting should be done when there is need for that particular part that is eligible for consumption. The fruits can be harvested when they are of sufficient size, they plant parts are edible at all stages, thus the growing shoots can be served when cooked as spinach. They can be prepared in different ways as the react with some ingredient and food stuff. Odiaka (2001)The plant (pumpkin) is everywhere in Nigeria today most especially in the south and eastern Nigeria though in very little quantity because of the low attention given to it but in most Nigeria markets there is non or low presentation of the crops for sale, people prefer crop of similar usage such as spinach, sorrel, mallow or tomatoes sweet pepper etc. choice (2016) has it that Edikang ikong soup is a very deliciously rich African vegetable soup commonly served as a top delicacy during very important occasions with pumpkin leaves as one of the ingredients, okra soup is a farm fresh soup recipe prepared with okra and green pumpkin leaves also as part of its ingredients. Although the crop can stand to perform the nutritional function of spinach, mellow, sorrel and for its medicinal value as blood turning agent, treatment of anemia, chronic fatigue diabetes, liver problem and impaired immune system, therefore due to insufficient knowledge, there is low demand, production as well as low market plan for pumpkin product, this makes the economics of the study area to suffer a serious setback, despite the high nutritional and medicinal value of pumpkin (Telfaria accedentalis) its production in Nigeria has failed to meet the domestic demand for its consumption , this include the vegetable farmers in North-Eastern Nigeria and in view of these fact, this study seeks to determine the factors affecting pumpkin production, analyze proper method of cultivation, different stages of pumpkin consumption as well as knowledge of the health benefit it provide to the body.

2.0 METHODOLOGY
2.1 The Study Area

The study was conducted in the three senatorial zones of Taraba state which comprises of   Northern zone: Jalingo, Ardo kola, Karim lamido, Lau, Yorro and Zing. Central zone: Kurmi, Gashaka, Sardauna, Gassol and Bali. Southern zone: Wukari, Takum, Ibi, Donga, Ussa and Yangtu development area, in each of the zone a local government was selected to enable the researcher carry out a valid study. The study was conducted in Gassol local government in Taraba State, Nigeria. It is located between latitude 8^o38N and longitude $10^046'E$ it has a total land area of approximately 5,548km^2 2, 14259 miles (Nigeria postal service 2009). The population was estimated to be 254,086 (NPC 2009) it shares a boundary between karim lamido local government area by the north, Ardo kola local government area by the east, Bali local government area by the south , Wukari, Ibi and Donga local government area by the west. The local government area consist of several ethnic groups which include Wurukum, Jenjo, Fulani ,Tiv, Jukun with Hausa as a widely spoken language , farming is the major occupation of the people with Maize, Groundnut, Cowpea, Yam, sorghum, melon as cultivated crops.   The local government area has a tropical climate marked by rainy and dry season which starts April and ends November and the dry season starts in November and end April. The minimum temperature of 15^0C maximum of 42^0C, the vegetation of the area is Guinea savannah characterized by tall tress with an average rain fall of 197mm (Mohammad J.A. 2016).

Donga local government was created in (1991) with headquarter in Donga main township. Donga is located at the southern part of Taraba State. The local government area is bordered by Wukari local government area in the north and north-west, south-east by Bali local government area, east by Kurmi local government area and south-west by Takum local government area. The local government area has a tropical climate marked by rainy and dry season which starts April and ends November and the dry season starts in November and end April. The mean annual rainfall is between 1020-1450mm and temperature range from 27-28°C, soil type is alluvia and sandy with occasional laterite out group here and there. There are rugged, hills and mountains with fertile land and valleys intervene within the local government area. Donga local government area fall within Guinea savannah zone characterized by wood and grass land, the majority tribe in Donga local government area are Jukun, Chamba, Ichen and Tiv while minor tribes include Igbo ,Hausa and Fulani. Villages within Donga local government area jurisdiction are;Akete, Suntia,Isha, Marmaraba, Ananum, Damsa, Afogba, Nyitan, Kombo, Gamkwe etc the major occupation of this people are farming. The Chamba and Jukum depend mostly on fishing, the tiv and Ichen on cropping (Yam, Beniseed, Maize, Groundnuts etc) while the Fulani rear their cattle's. Despite farming, some are civil servants' working with various department and sections within the local government area.

Jalingo local government area was created out of former Gongola in (1976) It is located between latitude 30^050E and 90^016N and longitude $11^085'N$ and 11^050E it has a total land area of approximately 5,548km² 2, 14259 miles (Nigeria postal service 2009). Jalingo local government area falls under dry and wet tropical climates the area has an average annual rainfall of about 1000mm and the average temperature of 27^0c , the majority tribe is Mumuye,karim and Jukum- kona while minor tribes include Igbo ,Hausa and Wurukum, soil type is sandy loam and clay

2.2 Sampling Techniques

A multi-stage sampling method involving a combined random sampling procedure was employed in drawing up the sample. The first stage was selecting the town and secondly selecting the district. The purpose for selecting this area was based on highest productivity of pumpkin per hectare and climatically suitable areas and it would help for economic researcher for reference in future research. The selected sites were Donga,Jalingo and Gassol as the districs will be tabulated as shown in table 1 .Thirdly, the sampling units (households) were sampled randomly from the selected district where equal number of households was drawn from each district. For the purpose of selecting desired number of sampling units from each village, the farm households of these villages were listed separately. The households listed were again stratified in to 3 size groups. Households having less than one hectare of operational land holding (<1ha, marginal).Households having one to two hectare of operational land holding (1-2 ha, small) Households having two to four hectare of operational land holding (2-4ha, medium) 60 marginal farmers, 39 small farmers and 51 large farmers were selected at randomly. Thus a total 150 respondents were selected at random for the purpose of this research study.

Table 1: Distribution by towns/villages sampled

Location/ villages	Copies of questionnaires	
	Distributed	Retrieved
GASSOL LGA		
Mutum biyu	12	12
Tela	25	25
Chonku	13	13
JALINGO LGA		
Nukkia	20	20
Kaswa bera	22	22
Iware	08	08
DONGA LGA		
Saminaka	10	10
Akete market	30	30
Kwata	10	10
Total	150	150

2.4 Data Analysis

In the study, a number of analytical approaches were used. They include; Descriptive Statistics,

2.4.1Descriptive Statistics

Descriptive Statistics such as mean, standard deviation and percentages were calculated on all variables including; pumpkin area (ha), yield (kg/ha), seed (kg/ha), labour used (man-day /ha), chemical fertilizer (kg/ha), manure (tonnes/ ha), cost of pesticides and insecticides (kg/ha), age of head (years), education (years), experiences (years), total agricultural areas (ha).

2.4.2 Constraint Analysis

The sample farmers and traders were asked to mention constraints and challenges they face in the production and marketing of maize. The questionnaire had pre- identified constraints from which farmers and traders were asked to indicate if they faced such constraints. Farmers were also asked to indicate any other constraints that did not appear on the list of pre-identified constraints. The frequency table and percentage were computed.

2.4.3 Farm Business Analysis

The following cost concepts were used to find out the costs structure in the production of pumpkin. Variable costs (seeds, Manure, Fertilizer, Human labour etc) Fixed costs (Rental value of land, Interest in fixed capital Depreciation) Total costs = Total variable cost (TVC) + Total Fixed Cost (TFC) For examining the cost of cultivation of pumpkin with its market price, the following concepts were worked out;

2.4.4 Estimation of measures of farm income employed the following measures

Gross Farm Income: (GI) was estimated at prevailing market prices of main product and by product at the time of harvest.
Net Farm Income (NI): NI was calculated by deducting total cast (TC) from Gross Farm Income (GI).NI=GI – TC
Returns on price: it was estimate by dividing Gross Income (GI) by Total Cost (Cost C2), B: C ratio = GI/ TC
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RESULT AND DISCUSSION
3.1 Cost Structure and Return on Pumpkin Production in the Sample Farms

Concept of cost and return used in this study are the same as generally adopted in the farm management studies. This section provides the cost structure prevailing in the study area. The costs were determined by keeping account the inputs that the farmers used in the cultivation of fluted pumpkin. For best decision making process in any farm business analysis, cost structure composition is crucial. The cost structure include variable cost, fixed cost, cost ratios etc. The analysis of cost and return indicates profitability of the farm business.

3.2 Variable Cost of Pumpkin Production in the Sample Farms

The variable cost is that cost which varies with the level of production. These costs include the cost of inputs responsible for production such as labor (human and machinery), seed, manure, fertilizer, pesticides and interest on working capital. It is observed from Table 2 that, the average variable cost per hectare is **N**17196.66 in all sample farms for one hectare of pumpkin cultivation. It is also observed from the study that, per hectare variable cost is high in marginal farms i.e.**N**18785.90, followed by medium and small farms **N**16276.57 and **#**14031.83 respectively. Seed accounted highest percentage of total variable cost i.e. 41.01% in all farm size.

Plant protection chemical accounts the next highest of total variable cost i.e. 25.20%.The per hectare expenditure on fertilizer is N3150.39 which accounted for 16.77% of the TVC that is third highest of all the input cost. On an average, per hectare expenditure on interest on working capital was 5.04% of TVC that is the least among all input. Per hectare expenditure on manure and labor was N2139.71 (11.39%) and N1553.59 (8.27%) respectively (Table 2).

3.3 Fixed Cost of Pumpkin Production in the Sample Farms

Fixed cost is part of the total cost calculation which decide whether the farmer stay in farm business or not. It is observed from Table 3 that on an average about N7179.31 was spent on fixed inputs on one hectare of pumpkin

production. Total fixed cost for marginal, small and medium farmer is N7836.43, N7190.44 and N7181.11 respectively, that the trend was highest cost for marginal farm followed by small and medium farm subsequently. Out of all the components of TFC, rental value of owned land for N6615.73 (92.15%) which is highest cost among all the fixed input and N59.58 (0.83%) is on land revenue which was least among all the fixed cost. Rental value of own land and land revenue is not the same for medium, small and marginal farms i.e. highest of N194.86 for small farmers. Depreciation was more for small and medium farmers as compared to marginal farmers because they use more of man power for operational farm business. On an average, depreciation accounts for N187.37 (1.63%) of the total cost which was spent on total fixed cost.

3.4 Total cost Farm Size and Gross Income of Pumpkin Cultivation in the Sample Farms

It was observed from the Table 4, that TC is about N24375.97 on an average for one hectare of pumpkin cultivation. Total cost is higher for marginal farms followed by medium followed by small farm. On an average, N26622.31, 23467.01 and 21212.94 are spent by marginal, medium and small farmers in the study area. The TC has been partitioned into variable and fixed cost. TVC constituted 70.54% of TC and TFC constituted 29.45% of TC on an average. The amount of variable and fixed cost is N17196.66 and N7179.31 respectively for all farms on an average the amount of fixed cost is high in marginal farm followed by small and medium farms and variable cost shown high in marginal farms followed by small and then medium farms. The table reveals that per hectare return of pumpkin was N73869.53 highest in case of medium farms followed by marginal farms N59251.87 and small farms N57359.88. On an average, total revenue for all farms is N65125.53 in one hectare of pumpkin cultivation. The cost of production per quintal of pumpkin is highest for marginal farms i.e. N26622.31 followed by medium farms N23467.01 and small farms N21212.94 and on average, total cost of production for all farm is N24375.97 in one hectare of pumpkin production. On an average about N40749.56 net profit gained in pumpkin production in the study area. Out of which, highest net return is in case of medium farmer N52656.68, followed by small farmers N33892.87 followed by marginal farmers N32629.56 as seen in the study area. From Table 4 the average benefit cost ratio is 2.7:1 in the study area. Hence, it is concluded that pumpkin production is profitable for all farms in the study area.

3.5 Farm Efficiency Measures in Different Farm Sizes

These ratio measures like gross ratio, fixed ratio and operating ratio were calculated to find farm efficiency measures. Farm efficiency is the ratio of total expenses to gross income. It is a combined measure of profit making ability of the farm which expresses the percentage of the gross income consumed by the expenses and is therefore, indicative of absolute size of business.

It represents profit margin for business as a whole. Table 5 indicated that gross ratio was highest for marginal farms (0.38) followed by small farms and medium farms (0.28) and (0.26) respectively. Fixed cost ratio was highest for marginal farms (0.11) followed by small farms and medium farms i.e. (0.09) and (0.08) respectively. But in case of operating ratio it is highest in case of marginal farm followed small farm and medium farm i.e. (0.27), (0.21) and (0.18) respectively. Table 4 shows that, an average of all farms of the gross ratio was 0.31, fixed ratio was 0.09 and operating ratio was 0.21 in the study area.

Table 2: Composition of variable cost of maize production (Naira per hectare) in different Categories of farm holdings

Particulars	Marginal farmers	Small farmer	Medium farmer	All farms
Seed	4492.00 (23.91%)	6086.00 (37.39%)	7475.10 (53.27%)	7054.02 (41.01%)
Fertilizer	3150.39 (16.77%)	2566.81 (15.77%)	1452.29 (10.35%)	2357.66 (13.71%)
Labour	1553.59 (8.27%)	1560.92 (9.59%)	1058.02 (6.46%)	1386.94 (8.51%)

Plant Protection Chemicals	4734.04 (25.20%)	2704.96 (19.14%)	2121.87 (9.95%)	3291.44 (19.14%
Equipment	1786.53 (9.51%)	1118.20 (6.87%)	1086.06 (7.74%)	1176.25 (6.84%)
Manure	2139.71 (11.39%)	1086.16 (7.68%)	7942.16 (5.66%)	2445.36 (14.22%)
Interest on working Capital	9486.80 (5.04%)	1064.48 (6.54%)	8250.54 (5.88%)	1065.87 (6.54%)
Total variable cost	18785.90 (100%)	16276.57 (100%)	14031.83 (100%)	17196.66 (100%)

Table 3:Composition of fixed cost of maize production (rupees per hectare) in different Categories of farm holdings

Particulars	Marginal farmers	Small farmer	Medium farmer	All farms
Rental value of land	6863.15 (87.58%)	6439.03 (89.55%)	6513.98 (90.71%)	6615.73 (92.15%)
Land revenue	123.03 (1.57%)	194.86 (2.71%)	98.38 (1.37%)	59.58 (0.83%)
Depreciation	181.02 (2.31%)	110.73 (1.54%)	76.84 (1.07%)	187.37 (1.63%)
Interest on fixed capital	669.23 (8.54%)	445.80 (6.20%)	491.90 (6.85%)	386.96 (5.39%)
Total fixed cost	7836.43 (100%)	7190.44 (100%)	7181.11 (100%)	7179.31 (100%)

Table 4: Total cost of pumpkin farm size, gross income and cost of production (per hectare) in different categories of farm holdings

Particulars	Marginal farmers	Small farmers	Medium farmers	All farms
Total variable cost (TVC)	18785.90 (70.54)	16276.57 (69.36)	14031.83 (66.15)	17196.66 (70.54)

Total fixed cost (TFC)	7836.41 (29.44)	7190.44 (30.64)	7181.19 (33.85)	7179.31 (29.45)
Total costs (TVC+TFC)	26622.31 (100.00)	23467.01 (100.00)	21212.94 (100.00)	24375.97 (100.00)
Cost of production (TC)	26622.31	23467.01	21212.94	24375.97
Gross return (TR)	59251.87	57359.88	73869.53	65125.53
Net return (TR-TC)	32629.56	33892.87	52656.59	40749. 56
Benefit cost ratio (B:C Ratio)	1.5:1	2.4:1	2.9:1	2.7:1

Table 5: Farm efficiency measures in different farm sizes

Categories of farmers	Gross ratio	Fixed ratio	Operating ratio
marginal farmers	0.38	0.113	0.27
small farmers	0.28	0.096	0.21
medium farmers	0.26	0.008	0.18
All farmers	0.31	0.009	0.21

Table 6: Ranking of various constraints in production faced by maize farmers

S. No.	Constraints in Production	Score	Rank	Constraints in marketing	Score	Rank
1	Education	6.2	V	Availability on Market days	3.5	V11
2	Household size	7.8	1V	Lack of transportation Facility	19.6	111
3	Age	4.9	V1	Lack of packaging	6.9	V
4	Moth infestation	42.4	1	Low storage facility	44.5	1
5	Seed/ farm size	8.1	1V	Irregular payment	33.3	11
6	Lack of capital	35.2	11			
7	Lack of technical input	12.6	111			

3.6 Marketing of Pumpkin Farmers

Production problems in the study area were presented in Table 6. All problems perceived by farmers were analyzed by Garrett ranking technique. Almost 41.6 score was gone for moth infestation to pumpkin as they eat and destroy it, which fetched less production to the farmer in the study area. About 35.2 score was given to lack of capital like not easy availability of fund; the government is not giving any incentive or subsidy to the farmer on the credit burrowed. Lack of technical input is the third most important problem (score 12.6) in the study area. In case of constraints in marketing, almost 44.5 score was gone for low storage of pumpkin which fetched less profit to the farmer in the marketing.

Irregular payment for the purchaser accounted about 33.3 of the score which got second next problem of marketing faced by pumpkin producer. About 19.6 scoring complained was lack of transportation facility. Other problems are availability on market days, lack of packaging facility which scores about 6.9.

4. CONCLUSIONS

Total variable cost of marginal farmers was higher than small and medium farmers. And the trend for fixed cost was highest for marginal farms followed by small and medium farm. The total cost and gross returns was higher for marginal farms. The benefit-cost ratio of N2.94 estimated from this study indicates that for every one naira spent, N2.94 will be realized as revenue. This means that 294% profit will be realized from one hectare of pumpkin production. This profit margin should attract financing from the lending institutions to pumpkin production. Since pumpkin production is profitable, there is need for the government to attract more unemployed youths into this business. Also, agrochemicals needed to tackle the incidence of pests and diseases should be provided at affordable prices by the government. In order to reduce transport cost, good road should be constructed by the government. Also, the problem of low market price could be tackled by controlling the supply of pumpkin into the local markets. Finally, the farmers should come together and form cooperative societies.

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