

American Journal of Economics (AJE)



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ABSTRACT

Purpose: The study examined the profitability of sesame (*Sesamum indicum*) production in Yobe State, Nigeria.

Methodology: One hundred and eighty (180) sesame farmers were sampled from 12 villages spread across three Local Government Areas in Yobe State using multistage sampling procedure. The descriptive statistics such as frequency, percentages and mean were used to describe the socioeconomic characteristics of farmers and constraints associated with sesame production. The inferential statistics employed was the Gross margin (GM) which was used to estimate the profitability of sesame production.

Findings: The result of socioeconomic characteristics revealed that majority (77.77%) of the respondents were aged between 21-60 years old and all (100%) of the respondents had one form of education or the other. The result of profitability of sesame production revealed that the gross margin (GM) was ₦157,519.00 and the average return per Naira invested was ₦2.07. Some of the major constraints faced by farmers in sesame production are inadequate fund (88.7%), inadequate extension services (72.0%), problem of pest and disease (66.1%) among others.

Recommendations: the study recommended that strategies to improve profitability should focus on improved farmer access to institutional credits and improved infrastructural facilities such as access roads for easy linkage to markets. Also, In order to cope with the problem of inadequate and high cost of seed, the government and research institute should make improved seed available at the right time and also at subsidies rate to the farmers.

Keywords: *sesame production, profitability, constraints, gross margin, Yobe State*

1.0 INTRODUCTION

Sesame (*sesamum indicum L.*) belongs to the plant family Pedaliacea The crop is believed to have originated in tropical Africa where the greatest genetic diversity exists and was later taken at a very early date to India where a secondary centre of diversity developed (Purseglove, 1996). The crop is now grown in a wide range of environments, extending from semi-arid tropics and sub-tropics to temperate regions (Raikwar and Srivastva, 2013). It is well to smaller farming with a relatively short harvest cycle of 90 – 140 days allowing other crops to be grown in the same field (Abu *et al.*, 2011)

World production of sesame was estimated to be 5,531,948 tonnes produced on 9,983,165 hectares of land in 2017. Asia is the major producers (56.4%) of sesame in the world, followed by Africa (39.3%) and America (4.4%). The largest producers of sesame is India (665,566.67 tonnes) followed by China (616,004.96 tonnes) while Nigeria (192,295.96 tonnes) ranks 8th out of the ten (10) major producing countries in the world (FAOSTAT, 2018).

Apart from foreign exchange earnings, the product is locally processed and used in diverse forms such as local snacks and pap known as “*kantun ridi*” and “*kunun ridi*” respectively. Additionally, oil is extracted from the seed and the cake is made into “*kulikuli*” which together with the leaves are used to prepare local soup known as “*miyar taushe*”. The oil is used for cooking and medicinal purposes such as the treatment of ulcers and burns. The stem and the oil extract are also used in making local soap. The young leaves are eaten in stews, and the dried stems can be used as a source of fuel (Chemonics, 2002). Industrially, most sesame is processed directly into oil, but can also be sold at various stages of processing, for various uses such as meal, paste, confections, and bakery products. The oil can also be used as raw material for production of paints, margarine and varnishes.

Major sesame producing states in Nigeria are Nasarawa, Jigawa, Benue, Yobe, Kano, Katsina, Kogi, Gombe and Plateau States (Nigeria Export Promotion Council (NEPC), 2014). In Africa, Nigeria is the largest producer of sesame seeds, about 90% of sesame seeds produced in the country are exported. In the first quarter of 2018, it was reported that sesame was the most exported non-oil commodity, contributing 0.57% to the total export value and 36.39% of agricultural exports (Proshare, 2018). Nigeria has the highest untapped potential from sesame export estimated to be \$170 million (NEPC, 2018).

In recent time, more emphasis is now being placed on increased domestic supplies of agricultural products. One of the major factors responsible for low agricultural productivity in Nigeria is farmers’ limited access to production inputs which are necessary for attaining a high level of profit (Nwaru, 2004). Amaza and Olayemi (2002) observed that crop farmers mostly carry out their production under conditions involving the use of inefficient tools and unimproved seed varieties and therefore, maximum profitability is elusive to them.

In the same vein, Sesame production has started to decline at all levels. At the world level, sesame production was reported to have declined from 6,270,708 tonnes in 2014 to

5,531,948 tonnes in 2017 with an area of 10,898,243 and 9,983,165 hectares respectively which has also led to slight decline in productivity from 0.57 tons/hectares in 2014 to 0.55 tons/hectares in 2017 (FAO, 2018). In Nigeria, sesame production decline from 994,800 tonnes in 2012 to 550,000 tonnes in 2017 with an area of 499100 and 500000 hectares respectively while productivity had also decline from 1.99 tons/hectares in 2012 to 1.1 tons/hectares in 2017 (FAO, 2018). Also, some studies on sesame also indicated a wide gap between potential and actual yields obtained (Raw Material Research and Development Council (RMRDC)), 2004, Olowe, 2007; NAERLS, 2010; Kanton *et al.*, 2013). The National Agricultural Extension and Research Liaison Services (NAERLS), (2010) reported actual sesame yield of 300kg/ha against potential yield of between 700-1,000 kg/ha which is below the world average yield of 4,900kg/ha and four times lower than the average yield of other oil seed crops like groundnut and soybean. Manyong *et al.* (2005) added that actual sesame yield was 0.55 tonnes/ha against a potential yield of 2 tonnes/ha with a yield gap of 264% for North-Central Nigeria. The decline in sesame production could be due to the fact that some farmers abandoned the production of sesame for more remunerative crops like groundnut and soy bean as a result of low profit. In addition, production decline could be due to the inadequate institutional and technological framework put in place which reduces profit. While the production of sesame is on the decline in the study area, the demand for the commodity is growing strongly in all the major consuming countries.

Sesame is one of the important commercial crops grown in Yobe State. It is reported that 85% of small scale farmers in Yobe State are involved in sesame production, processing and marketing in the area which indicates the potentials of the crop to uplifting the living standard of all the actors involved in its production, marketing and processing (Oladimeji *et al.*, 2014). The international price of sesame has been on the rise as a result of the increasing demand for the product in most parts of the world. However, this increase in the price of the product is being upset by the ever rising cost of the inputs in the nation which in return is reducing farmers' profit.

As a result of its high demand, any quantity of the product offered to the market is easily sold. This increasing demand for sesame seed provides Nigeria an opportunity to increase its production to meet the international demand for the commodity. The realization of the potential of sesame production in the acquisition of foreign currency for the country made production of the crop a prominent priority in the agricultural sector of Nigeria. Profitability measures the capability of farmers to cover their costs. It is defined as the total value of production less the total cost of production. The gross farm income is the total physical product per unit price of the product. According to Olukosi and Erhabor (1988), the net farm income refers the difference between the gross farm income and total cost of production (fixed and variable cost).

Production function provides a guide to farmers in decision making with reference to optimal use of scarce resources. It follows from production function that dual approach can be utilized to examine the relationship between production, cost and profit function. Therefore, it's possible to derive profit and cost function from fundamental production function. There is duality between production and profit (cost) function such that the existence of one implies the

unique existence of the other. The theoretical framework of this study is supported by the theory of cost and production function.

Theory of Cost: In the process of agricultural production as well as other production process, cost is incurred. This can be so as a result of scarce resources, hence they attract price and they have alternative uses. During this study attention is specifically focused on fixed and variable costs. Total cost of production is broadly divided into fixed and variable cost within the short run. However, in the long-run, all factors of production are variable. Fixed costs are the overhead production costs, which don't vary with the level of production. Examples are salaries of permanent staff, rent on land, and depreciation allowance on fixed assets, such as farm buildings, fence, machinery and equipment. Again, the concept of fixed cost is meaningful only in the short-run. In the long run, every cost becomes variable. Variable Costs are the cost incurred as a result of the utilization of variable inputs within the production process. Variable costs vary with the level of production. Examples are the wages of unskilled labour, transportation cost, and the cost of herbicides, pesticides, fertilizers and seeds in sesame production process. Total cost is the sum of fixed cost and total variable cost. Total cost can be expressed mathematical as follows:

$$TC = TFC + TVC \quad \text{---1}$$

Where, TC = total cost, TFC = total fixed cost and TVC = total variable cost.

Total Revenue : This is defined as the gross receipt obtained from the sale of total product. If TR = total revenue, Q = quantity produced, and P = unit output price, then total revenue is,

$$TR = QP \quad \text{---2}$$

Profit : If a sesame farmer can sell all the output that he or she produces at the going market price, the resulting total revenue (TR) function is a line with a constant positive slope of P. $TR = PQ$, where, P = constant market price and Q = the output. The farmer's profit is equal to total revenue (TR) minus total cost (TC). Profit can be expressed mathematically $\pi = TR - TC$ where π is profit. According to Debertin (2012), the greatest or maximum profit will be attained when the difference between TR and TC is greatest.

Factors of Production: The factors of production in agriculture are traditionally classified into land, labour, capital and management. The costs of agricultural production include the returns to any or all factors utilized in the production process, such as rent on land, interest on capital, cost of machine hire and expenses on seeds, the wages of hired labour, and fertilizers. Labour is the work done by human being, and not the persons themselves. When a farmer hires a laborer, he is buying only so many hours of work and not the man himself (Debertin, 2012). Agricultural production is a labor-intensive activity in Nigeria. In the light of this, the cost of sesame production would be highly sensitive to variations in labour cost across time and space. Labour in agriculture could be categorized into family and hired labour. Dzer (2015) in a study titled Evaluation of the production efficiency and profitability of sesame production in Gwer East and Konshisha Local Government Areas of Benue State, Nigeria reported a gross farm income of ₦116,992.38 and a return per naira invested of ₦1.94 was realized. This implies that sesame production is a profitable venture in the study area. Adole (2016) reported that major constraints faced by sesame farmers in the study area are inadequate capital, poor market pricing, lack of modern cleaning, facilities, high cost and diversion of fertilizers to other crops.

Despite all the effort made, little attention has been paid to the investigation of the profitability of sesame farmers in Yobe State. Most studies conducted on sesame in the recent past by Godwin *et al.*, (2011); Oladimeji *et al.* (2014) Umar *et al.*, (2011); Nyiatagher and Ocholi (2015); Dzer (2015); Rukwe and Zubairu (2019) had been on profitability in different states without looking at the constraints to sesame profitability. A study on sesame profitability aimed at discovering constraints contributing to low profit that could be exploited to aid farmers improve/increase their profitability is inadequate. The main objective of the study is to determine the profitability of sesame production in Yobe State, Nigeria. The specific objectives are to:

- i. Describe the socioeconomic characteristics of sesame farmers in the study area;
- ii. Estimate the profitability of sesame production among the farmers; and
- iii. Describe the constraints militating against sesame production in the study area.

2.0 METHODOLOGY

2.1 Background to the Study Area

Yobe State is situated between latitudes 10°25'55" North to 11°34'25" East and longitudes 11°19'50" East to 13°25'13" North of the equator. It has a total area of 45,502 km² and a projected population of 3,408,062 as at 2018 using an annual growth rate of 3.2% (NPC, 2006), with a population density of 74.9/km². It is made up of three (3) agricultural zones consisting of 17 Local Governments Areas which include Zone I, Zone II and Zone III. The State borders the Nigerian states of Borno to the south and east, Bauchi and Jigawa States on the west and Gombe state on the south. It shares international borders with the Diffa Region and Zinder Region in the Republic of Niger to the north.

The State lies mainly in the dry Savanna belt. Weather conditions are hot and dry for most of the year with temperatures ranging from 30°C – 42°C. Annual rainfall usually last for about 120 days in the north and more than 140 days in the south which ranges from 400mm - 500mm in the North and 600mm – 1000m in the southern part of the state. This climatic condition favours the growth and development of sesame requiring little water.

Yobe State is an agrarian state. The main occupation of its people is small scale subsistence farming. Major crops grown include sesame, rice, maize, sorghum, wheat, gum arabic, groundnuts, beans and cotton. Livestock kept includes sheep, cattle and goat. The major ethnic groups are Fulani and Kanuri while other ethnic communities of the area include Ngizim, Karai-Karai, Bade, Bolewa, Shuwa, Ngamo, Hausa, Bura, Marghi and Manga (Yobe State Government Home Page (YSGHP), 2011).

As a subsistent smallholder farmer, the crop supply chain is characterized by buyers or agents who go round the rural communities purchasing from the farmers. The sesame is transported to the larger towns, bulked in store and sold to the agents of the major exporters. The major buying center is the urban market in Potiskum (Chemonics, 2002).

2.2 Analytical Techniques

The data were subjected to descriptive and inferential statistics. The descriptive statistics used include frequency, percentages and mean were used to analyzed Objectives i, and iii. The inferential statistics employed was the Gross Margin (GM) was used to achieve objective ii.

2.2.1 Gross Margin Analysis

The Gross Margin (GM) Analysis was used to estimate the profitability of sesame production. The GM model is expressed as:

$$GM = \sum p_i \cdot q_i - \sum r_j \cdot x_j \dots\dots\dots 3$$

Where: GM = Farm gross margin (₦/ha); p = Unit price of output (Sesame seed) (₦); q = Quantity of output (kg); r = Cost of variable input (₦); x = Quantity of variable input (kg);
 i = 1, 2... n number of outputs used in sesame seed production; j = 1, 2... n number of inputs used in sesame seed production.

Profitability is a measure of the efficiency of the business or farm using its resources to produce profit. In order to determine if an enterprise is profitable or not, profitability index estimated as follows:

Profitability Index (PI) – This is the Gross Farm Income per unit of total variable cost

$$PI = \frac{\text{gross margin}}{\text{total variable cost}} \dots\dots\dots 4$$

2.3 Sampling Procedure

The respondents for the study were selected using Multistage sampling procedure. The Yobe State is divided into three zones namely; Zone I, Zone II and Zone III. All the three zones were included in the survey because the sesame growing areas transverse all the zones. The first stage involved purposive selection of one Local Government Area from each of the three (3) zones in the state known for sesame production and is accessible. The selected Local Government Areas are Potiskum (Zone I), Jakusko (Zone II) and Tarmuwa (Zone III). The second stage involved the purposive selection of four major sesame producing communities in each of the three Local Government area selected based on the intensity of sesame farming practiced in the communities. The list of sesame farming villages was obtained from Yobe State Agricultural development Programme (YOSADP) office. Twelve communities with the highest number of sesame farmers were selected across the three Local Government Areas. The third stage involved estimation of sample size from the sample frame using Yamane (1967) (equation 5). In the Last stage, the number of farmers in each communities were selected using Shaikh *et al.* (2016) (equation 6) as shown in Table 1. The sampling frame was obtained from YOSADP.

Following Yamane’s sample size determination procedure Yamane (1967), the optimal sample size was determined based on a population of 1501 from the sampling frame as detailed in Table 1 using a precision level of 7% which gives a sample size 180 farmers

Sample size

$$n = \frac{N}{1 + N(e)^2} \dots\dots\dots 5$$

Therefore, sample size (n) = $\frac{1501}{1 + 1501(0.07)^2}$

$$n = \frac{1501}{8.3549} = 180$$

Where

n = Sample size

N = Population size

e = level of precision (acceptable sample error).

Using Shaikh *et al.* (2016), the number of respondent in each community was obtained with the help of the formula below as shown in Table 1.

$$NI = \frac{n}{N} \times Ni \text{-----6}$$

Where

NI = sample size in each village

n = total number of sample size, that is 180

N = total number of farmers in the targeted population, that is total sample frame (1501)

Ni = total number of farmers in each village

Table 1: Sample Distribution

Senatorial Districts	LGA	Communities	Sample Frame	$NI = \frac{n}{N} \times Ni$	Sample Size
Yobe North	Jakusko	Jakusko	159	$(180/1501) \times 159$	19
		Buduwa	179	$(180/1501) \times 179$	21
		Girgir	89	$(180/1501) \times 89$	11
		Amshi	121	$(180/1501) \times 121$	15
Yobe East	Tarmuwa	Babangida	146	$(180/1501) \times 146$	18
		Lantaiwa	99	$(180/1501) \times 99$	12
		Biriri	110	$(180/1501) \times 110$	13
		Koriyel	97	$(180/1501) \times 97$	12
Yobe South	Potiskum	Alaraba	94	$(180/1501) \times 94$	11
		Badejo	103	$(180/1501) \times 103$	12
		Mazagane	133	$(180/1501) \times 133$	16
		Potiskum	171	$(180/1501) \times 171$	20
Total			1501		180

Source: Field Survey, 2019

2.3 Sources of Data

The data for this study were obtained from primary and secondary sources. Primary data were collected through the use of structured questionnaire distributed to sesame farmers in the study area. Secondary information was obtained from list of registered sesame farmers, journals, textbooks, publications, Government gazettes, internet and other sources.

3.0 RESULTS AND DISCUSSION

3.1 Socioeconomic Characteristics of Sesame Farmers

This section shows the distribution of respondents according to gender, marital status, age, educational level, farming experience, household size, secondary occupation, farm income, extension contact, farm size, farming experience, training, variety, membership of cooperatives and amount of credit received. The result of the socioeconomic characteristics is presented in Tables 1 A and B.

Age

The result of the age of sesame farmers indicates that majority (77.77%) of the respondents were aged between 21-60 years with mean age of 38.5 years. This implies that they are predominantly youths and hence agile and economically productive. The finding agrees with those of Yakubu (2002), Oladimeji *et al.* (2014) and Adamu and Bakari (2015) reported that the most active farmers' age group engaged in agricultural production was within 21-60 years and are more willing and able to take risk in expectation of profit more than the older ones.

Gender

The result on gender revealed that majority (66.67%) of the respondents were males and 33.9% were females, implying that sesame production was dominated by males. The reason could be attributed partly to the fact that since mostly men have more physical strength than their female counterparts, they engaged more in strenuous activities while the female take part mostly in marketing activities. This study coincide with that of Fasoranti (2006) reported that men have more access to the resources and information required to produce crops more efficiently than their female counterparts. Similarly, Oladimeji *et al.* (2014) and Adamu and Bakari (2015) reported that sesame farming was dominated by males than females.

Marital Status

Marital status of the farmers in the study area revealed that the majority (77.22%) of respondents were married, 12.4% were single, implying that sesame farming is dominated by married people. This is due to the fact that married people have to bring food to the house to feed their family. Widows, divorcees and widowers also have to farm, for they do not have someone to be feeding them. This study agrees with Tijani *et al.* (2010) who reported that 60% of the farming household were married.

Educational Level

The study revealed that all (100%) of the respondents had one form of education or the other which indicating that most of the respondents were literate. This implies there is potential for

increased sesame profit since education would enable farmers to have access to information on new agricultural innovations. Education is important in determining the farmers ability to access, process and implement information on agricultural technologies (Zbinden and Lee, 2005).

Table 1A: Distribution on Socio-economic Characteristics of Sesame Farmers (n=180)

Variables	Frequency	Percentage	Mean
Age			
Below 21	28	15.56	38.5
21 – 40	95	52.77	
41 – 60	45	25	
Above 60	12	6.67	
Gender			
Male	120	66.67	
Female	60	33.33	
Marital status			
Married	139	77.22	
Single	22	12.22	
Widow	12	6.67	
Divorce	3	1.67	
Widower	4	2.22	
Educational Level			
Qur'anic	70	38.89	
Primary school	54	30	
Secondary school	36	20	
Tertiary	20	11.11	
Household size			
1—5	39	21.67	7
6—10	112	62.22	
11—15	15	8.33	
>15	14	7.78	
Farm size (Hectare)			
<1.00	7	3.9	2.4
1.00 - 2.00	80	44.44	
2.01 – 3.00	60	33.33	
Above 3.00	33	18.33	
Farming experience			
1—5	12	6.67	13
6—10	67	37.22	
11—15	40	22.22	
16-20	23	12.78	

Above 20	38	21.11
Secondary occupation		
Trading	67	37.22
Weaving	37	20.56
Civil service	32	17.78
Masonry	29	16.11
Blacksmithing	15	8.33

Source: Field Survey, 2019.

Table 1B: Distribution on Socio-economic Characteristics of Sesame Farmers (n= 180)

Variables	Frequency	Percentage	Mean
Annual Farm Income (₦)			
≤50,000.00	12	6.7	153,143.20
51,000-100,000	22	12.22	
101,000-150,000	40	22.22	
151,000-200,000	56	31.11	
≥200,000.00	50	27.78	
Annual non-farm income (₦)			
≤ 50,000.00	27	15	96,542.70
51,000.00 - 100,000.00	70	38.89	
101,000.00 -150,000.00	37	20.56	
151,000.00 - 200,000.00	31	17.22	
≥200,000.00	15	8.33	
Sources of fund			
Personal saving	110	61.11	
Credit	15	8.33	
Loan	19	10.56	
Gift	36	20	
Access to extension agents			

Had no access	119	66.11	
Had access	61	33.89	
Sources of labour			
Family	24	13.33	
Hired	48	26.67	
Both	108	60.00	
Land acquisition			
Inheritance	107	59.44	
Government	0	0	
Rent/lease	32	17.78	
Purchase	41	22.78	
Distance to market (km)			
1 – 5	50	27.8	7.6
5.1 – 10	79	43.9	
10.1 – 15	23	12.8	
Above 15	28	15.6	
Crop variety			
High yielding	27	15	
Local variety	153	85	
Membership of association			
Member	41	22.8	
Not member	139	77.2	
Access to Credit			
Had access	39	21.7	
Had no access	141	78.3	

Source: Field Survey, 2019.

Household Size

The study revealed that majority (62.22%) of the respondents had household size of between six to ten persons with a mean of seven persons. It has been observed in the study area that the higher the number of the household size, the higher the amount of family labour, as well as the size of land cultivated if majority of the household members are in their productive age and are male which can withstand stress and work for a long period of time. Also, if household size is large, the production goals have to do with profit making in the study area. This finding is in line with those of Solomon (2008) and Banmeke (2003) who reported that large household size assist on farm and other household activities. Makama *et al.* (2011) also reported that increase in household size increases the availability of family labour for farming operations, however if the bulk of the members in the household are within the unproductive age, level of production deteriorates. Adole (2016) also reported similar result with mean household size of eight persons.

Farm Size

The average farm size cultivated in the study area was 2.4 hectares with majority (81.67%) of the respondents cultivating (0.00-3ha). This implies that most of the farmers had small farm holdings. This shows that farmers in the study area will not be able to enjoy economy of scale in production. The larger the farm size of the household, the higher the expected level of output. According to Olayide *et al.* (1980), small scale farmers are those that cultivate land of 0.1 to 5.0 hectares of land. Therefore, the majority of the respondents in the study area are classified as small-scale farmers. This may not encourage mechanize system of farming and thus, production may continue to remain at subsistent level. This finding is in line with the findings of Ajeigbe *et al.* (2010); Makama *et al.* (2011); Oladimeji *et al.*, (2014) and Adamu and Bakari (2015) which reports that majority of the agricultural production is in the hands of small holder farmers. Imoh and Essien (2005) also reports that farm size affects adoption of technology and that determines whether a farmer will use improved seed or not. Relatively small farm size could constitute a major constraint to technology usage (Sani *et al.*, 2014).

Farming Experience

Farming experience shows that most (37.22%) of the respondents were having farming experience of 6 - 10 years with a mean of 13 years. It could be inferred that sesame farmers in the study area are well experienced in farming sesame and depicts good signal for higher farmers' profit. This finding agrees with that of Abu *et al.* (2011) and Adole (2016) which reported that the average farming experience of sesame farmers in Nasarawa State and Benue State were 12.8 and 15 years respectively. Oladimeji *et al.* (2014) and Adamu and Bakari (2015) also reported similar result in their findings. Amaza and Olayemi (2002) also reported that the higher the number of years spent in farming by a farmer, the more he becomes aware of new production techniques.

Secondary Occupation

Secondary occupation in the study area revealed that trading was engaged by most of the respondents (37.22%), followed by weaving (20.56%). Civil servant, Masonry and Blacksmithing represented 17.78%, 16.11%, and 8.33% respectively. This implies that all the sesame farmers in the study area were engaged in one activity or the other. It could be infer that

incomes from these occupations could be used to complement farm income to purchase inputs needed in the farming enterprise which would lead to increased farmers' profit.

Annual Farm Income

Similarly, the distribution of annual farm income in the study area showed that most (31.11%) of the farmers earned ₦151,000.00 – ₦200,000.00 as annual farm income with mean of ₦153,143.20 (approximately \$3.5). If farming households (average 7 members) without other source of income were to depend solely on the farm income for a minimum cropping season of 4 months, individual member of the household would be living below the poverty line of \$1 per day. This implies that the farmers earned low annual farm income when compared to the standard poverty line of one dollar per day. The low farm income could be as a result of constraints associated with sesame farming such as high cost of fertilizer, pest and disease, high cost of transportation, lack of improved seed varieties which can reduce farmers' profit.

Non-Farm Income

The finding of the study on the annual non-farm income also showed that most (38.89%) of the farmers earned ₦51,000.00 – ₦100,000.00 as their annual non-farm income with a mean of ₦96,542.70. This implies that sesame farmers in the area had additional sources of income which provides income to the households and also provide a form of guarantee to farmers against the risk of farming and hence stimulate them to adopt new methods of production and improve output of their wellbeing. Abu *et al.* (2011) observed that increased in non-farm income reduces financial constraints, especially for the resource-poor farmers and thus enable them to purchase inputs that will enhance effective production. However, the situation may have implication on proper supervision of farm activities.

Sources of Fund

Sources of fund used by the farmers in the production of sesame analyzed revealed that majority of the farmers source their funds from personal saving (61.11%). Farmers that source fund through credit, loan and gift were 8.33%, 10.56% and 20.0% respectively. This implies that the size of sesame production would be low and other inputs would be affected since fund is inadequate to enhance production.

Extension Visit

The distribution of the sampled farmers based on numbers of extension visit revealed that 66.11% of sesame farmers in the study area had no contact with extension agents. This could be attributed to low extension agent-farmers' ratio in the study area. This may have a negative influence on the adoption of improved sesame production technologies because contacts with extension agents exposes farmers to new technologies and improved varieties of inputs especially seed which would help to increase farmers output and translate to higher profit. Adole (2016) reported that 78.9 had no contact with extension agents in Benue State.

Sources of Labour

The result also showed that majority (60%) of sesame farmers used both family and hired labour while 13.33 and 26.67 of sesame farmers used only family and hired labour respectively. This implied that majority of sesame farmers obtained their labour from both family and hired labour which could be attributed to inadequate and high cost of labour in the study area. This study is in line with Tijani *et al.* (2010) who reported that 72% of farming households used both family and hired labour.

Land Acquisition

Among the different forms of land ownership in study area, land owned through inheritance was the most dominants which accounted for 59.44%. Farmers that obtained their land by purchase constituted 22.78%. Meanwhile, 17.78% of the respondents acquired their land through lease/rent. This implies that easy access to land led to high profit. This result is similar to that of Rahman (2003) who reported that land acquisition by inheritance and purchase tend to promote security, motivation and good management to farmers for efficient utilization of resources than land acquired through lease or hired. Alfa-nla (2014) also report that most (42%) of the respondents acquired their land through inheritance, 16% got theirs through lease, 23% purchased their land while 10.5% obtained theirs through gift. This may mean that, there is the opportunity for people that might want to go into commercial production of this crop with 23% of the respondents being able to purchase their own land.

Distance of Farms to Market

Distance of farms to the nearest market was also analyzed. The result revealed that majority (84.5%) of the respondents' farms were located within a distance of 0.1 - 15km away from near market with a mean distance of 7.6km. Only 15.6% of the respondents farms were located at a distance more than 15km. This indicates that farms were located within a reasonable distance from the markets. This implies that nearness to the market provides convenience and reduction in transaction and transportation costs for farmers which help to increased farmers profit. When farms are located close to markets, inputs can be easily accessed and outputs can be easily disposed. This finding is in line with Mohammed (2012) who also reported similar result.

Crop Variety

The variety of crop planted by sesame farmers in the study area revealed that majority (85.0%) of sesame farmers used local variety of sesame as against 15.0% that used improved sesame varieties. This could have the implication on quantity and quality of sesame crop produce which subsequently affect farmers profit as a result of low productivity.

Membership of Cooperative

The result of membership in cooperatives revealed that majority (77.2%) of sesame farmers did not participate in cooperative association. The implication of this result is that most of the sesame farmers in the study area did not enjoy the benefits accrued to co-operative societies through pooling of resources together for a better expansion, efficiency and effective

management of resources and for profit maximization. The finding is similar to that of Adole (2016) who reported that 73.9 of the respondents did not participate in cooperatives.

Access to Credit

The result indicates that majority (78.3%) of sesame farmers in the study area had no access to credit to finance their sesame production activities. The implication is that the size of sesame production will be small and other inputs will be affected since capital is not available to enhance production which would translate into low farmers' profit. The result agrees with the finding of Adole (2016) who reported that 56.1% of the respondents had no access to credit in a study in Benue State.

3.2 Profitability of Sesame Production

Table 2 presents result of the farm profitability analysis in sesame production. The variable inputs employed in sesame production are seeds, pesticides, fertilizers, herbicides, labour, Cost of transport and others. The result revealed that the cost of labour incurred by sesame farmers amounting to ₦66,354.00 which constitutes 45.1% of the total cost of production. Therefore, sesame production is labour intensive in the study area. The implication for this is that additional profit could be obtained when labour is efficiently utilized.

The average quantity of seed planted per hectare was 30kg. The seeding rate was higher than the recommended seedling rate of 5kg/ha (NAERLS, 2010). This implies that the farmers were over using seeds. The Cost of seed was ₦215.10 which constitutes 4.4% of the total cost of production and seeds are important factor influencing yield potentials in terms of optimum return of the crop in the study area. This result is in consonance with that of Adole (2016) who reported that the average quantity of sesame seed planted per hectare was 15.78kg in Benue State which is also above the recommended rate.

Table 2: Gross Margin in Naira per Hectare for Sesame Production

Item	Unit Price (₦)	Quantity per hectare (kg)	Naira/Hectare	Percentage
Total Revenue	200	1,522.8	304,560.00	
Variables cost				
cost of Seed	215.10	30	6,453.00	4.4
cost of Fertilizer	2,068.00	10	20,340.00	13.8
cost of Pesticides	1,423.00	10	14,230.00	9.7
cost of Herbicides	1,337.11	9	12,034.00	8.2
cost of Labour	1,658.85	40	66,354.00	45.1
cost of Transports			7,630.00	5.2
Others			20,000.00	13.6
Total Variables cost			147,041.00	100.0
Gross margin			157,519.00	
Average rate of return			2.07	

Source: Field Survey, 2019.

The average quantity of inorganic of fertilizer used by the farmers was 10kg per hectare which was below the recommended rate of 100kg per hectare (NAERLS, 2010). The low rate of fertilizer usage could be attributed to the fact that the soil was fertile, resulting in underutilization of fertilizer. The cost of fertilizer was ₦20,340.00 which makes up 13.8% of the total cost. This result is contrary to Adole (2016) who reported an average quantity of inorganic of fertilizer used by the farmers by was 161.20 kg per hectare which is above the recommended rate per hectare which could be attributed to declining soil organic matter in the soils and inappropriate fertilizer usage.

The cost of herbicides was ₦12,034.00 which constituted 8.2% of the total cost of production. The average quantity of herbicide used by sesame farmers was 9 litres per hectare which was above the recommended rate of 2-2.5 litres per hectare (NAERLS, 2010). This may be due to the fact that the market price was higher and there is overutilization of herbicides by farmers in the study area. This result is contrary to the finding of Adole (2016) who reported that the average quantity of herbicide used by sesame farmers was 2.09 litres per hectare which is consistent with the recommended rate.

Cost of pesticides was ₦14,230.00 which constituted 9.7% of the total cost of production. The average quantity of pesticides applied in the farm was 10 litre which was higher than the recommended rate of 1 litre (German Technical Cooperation (GTZ), 2009). This implies that pesticides was over-used. This result was in tandem with the result obtained by Umar (2010) who reported similar result that 1.9 litre of pesticides was used which is also above the recommended rate.

The cost of transport was ₦7,630.00 and constituted 5.2% of the total cost of production and other cost incurred was ₦20,000.00 constituted 13.6% of the total cost of production. The cost of transportation was low because farms were located within a reasonable distance to the market.

The average quantity of yield per hectare obtained in the study area was 1,522.8kg and the unit price was ₦200 per hectare. Average gross farm income of ₦304,560.00 per hectare was estimated. The result also revealed that the total variable cost (TVC) was ₦147,041.00. The Gross Margin was therefore ₦157,519.00 per hectare. The findings implies that sesame production is profitable in the study area and thus any effort at expanding it would be a good decision because significant differences were observed in the study in terms of cost of inputs incurred and the revenue realized. The average rate of return on investment (return per Naira invested) was 2.07 indicating that for each Naira invested, there is a return of ₦2.07. Similar result was reported by Makama *et al.* (2011) and Adole (2016) that sesame production is a profitable venture. This result shows that sesame production in the study area is profitable.

3.3 Constraints Associated with Sesame Production in the Study Area

Table 3 present constraints faced by sesame farmers in the study area. The major constraints faced by sesame farmers in the study area are inadequate fund, inadequate of extension services, problem of pest and disease, high cost of fertilizers, inadequate of good road network, inadequate of credit, poor market prices, poor storage facilities, scarcity of improved seed, weed control, high cost of transport, inadequate of modern cleaning technology and inadequate of agrochemicals.

Inadequate fund was ranked first by majority (88.7%) of the respondents as a main constraint in sesame production. This affects sesame production in the study area, because the meager savings the farmers might have made or the funds generated from relatives was not sufficient to satisfy various activities in sesame production. Similar result was reported by Abu *et al.* (2012) and Adole (2016) that 92.3% and 80.5% of sesame farmers respectively were facing similar problem of lack of fund in the study area. Also, Mark and Sorsa (2009) who reported that producers complained that shortage of capital and stringent conditions imposed by banks for securing loans have deterred their performance in sesame production and marketing.

Table 3: Constraints Associated with Sesame Production

Farm constraint	Frequency*	Percentage	Rank
Inadequate fund	165	88.7	1 st
Inadequate/lack of extension services	134	72.0	2 nd
Problem of pest and disease	123	66.1	3 rd
High cost of fertilizers	120	64.5	4 th
Inadequate good road network	112	60.2	5 th
Poor market prices	87	46.8	6 th
Poor storage facilities	80	43.0	7 th
Scarcity of improved seed	76	40.9	8 th
Weed control	76	40.9	8 th
inadequate modern cleaning technology	65	34.9	10 th
High cost of agrochemicals	45	24.2	11 th

Source: Field survey, (2009).

* = Multiple choices allowed

The second ranked most pressing constraint is inadequate extension service which accounts for about 72.0% of the problems militating against sesame farmers. The implication is that sesame farmers in the study area are unable to get information about the state of latest agricultural technology, pest management and proper and timely use of agricultural inputs. This study is in tandem with that of Adole (2016) who reported that 50% of sesame farmers in its study area also encountered the problem of inadequate extension service. Abu *et al.* (2012) also reported 54% of sesame farmers in Benue State also faces the problem of inadequate extension service. NEPC (2014) also reported that inadequate extension service was a problem in sesame production.

The problems of pests and diseases ranked third constituting 66.1% of the overall problems of the sesame farmers. This implies that sesame farmers in the study area were faced with the problem of pest and disease infestation which could lead to reduction in the quantity and quality of sesame thereby reducing farmers' profit. This result is in tandem with that of Umar (2010) who reported that pest and disease infestation was a constraint in Nasarawa State.

High cost of fertilizers was ranked as the 4th major constraint by 64.5% of the respondents. This implies that fertilizer was too expensive for the farmers to buy and if eventually gotten it will increase cost of production and therefore reduce the farmers' profit. This result is in consonance with that of Abu *et al.* (2012) who reported that 82.0% of sesame farmers were faced with the constraint of high cost of fertilizers in the study area.

Inadequate of good road network and high cost of transport is the 5th pressing problems of the sesame farmers. This problem accounted for 60.2% of the sesame farmers' problems. Most of the roads leading to their farms are inaccessible by cars especially during the rainy seasons. Inadequate good road network obstruct the free movement of farm produce from the farm to the market or home, and also farm inputs from the market or home to the farm. As a result, inadequate feeder roads translates into high cost of transportation in moving farm produce from the rural areas which reduces farmers' profit. This study is in tandem with that of Adole (2016) who reported that poor road was one of the constraint faced by 38.9% of sesame farmers in the study area.

Poor market prices ranked 6th among the constraints faced by farmers in the study area. This constraint affect 46.8% of the respondents. These farmers produce small amount of sesame resulting in weak bargaining power and low prices. This conforms to the findings of Umar (2010); Tihamiyu *et al.* (2013); NEPC (2014) and Adole (2016). They reported that poor market prices was one of the problems bedeviling sesame farmers.

43.0% of the sesame farmers had poor storage facilities to be their problem in sesame production which was ranked 7th out of the numerous problems militating against sesame production. Poor storage facilities in some cases lead to post-harvest loses of farm produce which in turn reduces the profit of the farmer. The finding is consistent with the finding of Umar (2010) also reported that sesame farmers were faced with the problem of poor storage facilities.

40.9% of the sesame farmers had scarcity of improved seed to be their problem in sesame production which was ranked 8th out of the numerous problems militating against sesame production. The farmers confessed that they make use of seeds from their previous harvest which is not reliable and can jeopardize improved and sustainable productivity. Inadequate improved seed can lead to low farm produce which in turn reduces the profit of the farmers in the study area.

Also, 40.9% of the respondents identified weed control problem as the 8th constraint in sesame production, implying that weed is one of the major challenge to sesame farmers. This have negative effect on production because it increases costs of labour and herbicides and equally affects the performance and yield of sesame production in the study area which in turn reduce farmers' profit. Similar result was reported by Abu *et al.* (2012) who stated that 73.7% of sesame farmers in the study area identify weed control as a constraint facing sesame farmers in the study area.

In the same vein, 34.9% of respondents identified lack of modern cleaning as a constraint which was ranked 10th. Most farmers thresh and dry sesame on the bare ground, this leads to unclean sesame seeds because it becomes mixed with soil. Cleaning and sorting is done manually by women using trays and the seeds are not properly cleaned thereby devaluing the output price which reduce farmers' profit.

High cost of agrochemical was the 11th rank problem encountered by the farmers in the study area. The study revealed that 24.2% of the farmers were faced with this problem. This implies that some of the farmers were unable to acquire chemical and the high cost of chemical reduces farmers' profit in the study area. This result is in tandem with that of Abu *et al.* (2012) also reported that 75.8% of sesame farmers stated that high cost of agrochemicals was one of the constraint faced by sesame farmers in the study area.

4.0 Conclusions and Recommendations

It can be concluded that sesame production in the study area is a profitable farming venture. This profitability has positive implications for investment opportunities for farmers, NGOs and corporate organizations. Also adjustment in the production inputs such as farm size, seed, labour and efficient use of pesticides, fertilizers, herbicides and their cost of acquisition could lead to increased sesame production as well as profit. Noticeable gaps in profit could be improved upon if constraints such as inadequate fund, inadequate extension services, problem of pest and disease, high cost of fertilizers, inadequate good road network, poor market prices, scarcity of improved seed, weed control, inadequate modern cleaning technology and high cost of agrochemicals are addressed thereby contributing to the wellbeing of sesame farmers as well as their standard of living. The following recommendations were made:

1. Farmers should be encourage to form well managed cooperatives or producer farmer groups and networks as avenues for accessing inputs, output markets, as well as credit facilities to invest in farming.

2. Strategies to improve profitability should focus on improved farmer access to institutional credits and improved infrastructural facilities such as access roads for easy linkage to markets.

In order to cope with the problem of inadequate and high cost of seed, the government and research institute should make improved seed available at the right time and also at subsidies rate to the farmers.

4.1 Suggestion for Further Study

Effect of socioeconomic activities on the profitability of sesame farmers.

1. Effect of non-farm income on the profitability of sesame farmers.

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