Original Research Article

COST AND RETURNS ANALYSIS OF GROUNDNUT PRODUCTION IN QUAAN- PAN LOCAL GOVERNMENT AREA OF PLATEAU STATE, NIGERIA

ABSTRACT

This study assessed cost and returns analysis of groundnut production in Quaan-Pan Local Government Area of Plateau State, Nigeria. The specific objectives were to determine the socio economic characteristics of groundnut producers in the study area, estimate the cost and returns of groundnut production, determine the input and output relationship in groundnut production and identify the constraints faced by groundnut farmers in the study area. Multistage sampling technique was used in selecting 150 respondents for the study. Primary data were collected through the use of structured questionnaires and interview technique and were subjected to both descriptive and inferential statistics. The results obtained from the study revealed that the mean age of the respondents was 38 years with males dominating (82%) the groundnut production enterprise in the study area. Greater (85%) percentages of respondents were married with majority (64%) of them having primary school education. The respondents had an average household size of nine (9) persons, a mean farming experience of 9.3 years and an average farm size of 3.0 hectares. The result also revealed that majority (72%) of the respondents did not belong to any cooperative/ farming association. The result indicates that majority (79%) of the groundnut farmers acquired their farmland by inheritance. Groundnut production in the study area is profitable. The average output obtained per hectare was 696 kg at the prevailing selling price of ₦280/kg.The total revenue (TR), gross margin (GM) and, net farm income (NFI) per hectare obtained were ₦194880, ₦139380 and ₦123730 respectively. The return on naira invested (RNI) by farmers in the study area was ₦1.70 indicating that for every one naira invested, ₦1.70 profit was gained. The result of the double log production function analysis shows that farm size, cost of fertilizer and cost of labour were statistically significant and influenced the profitability of groundnut production. Major constraints to groundnut production in the study area include; high cost of inputs (64 %), high cost of labour (49 %), lack of organized market system (47%), land tenure (42%) among others.The study recommends that groundnut stakeholders and research institutes should work more on introducing new improved groundnut varieties. Government should subsidize groundnut inputs like recommended fertilizer and herbicides so as to motivate farmers to grow groundnut. Government should establish organized marketing systems where farmers will have proper and reliable linkages with buyers thereby reducing the undue exploitative tendencies of the middlemen. Improved storage facilities should be provided so that farmers could store their produce to avoid spoilage and for sale during times of scarcity.

Key words: Cost, returns, analysis, groundnut, production

1. INTRODUCTION

Groundnut (*Arachis hypogaea*), is a species in the legume or "bean" family *Fabaceae,* which has replaced the traditional bambara peanuts (*Vigna Subterranean*) in many parts of the country (1). They are legumes containing 20-50% protein, 40-50% fat, and 10-20% carbohydrates. It is cultivated in semi-arid and subtropical regions in about 114 countries with an area of about 31.2 million hectares, with an annual yield of 60.5 million metric tons (million tons) and an average yield of 1.4 metric tons per hectare in 2014 (2). Malaysia, Israel, China, Nicaragua, Nigeria, USA and Saudi Arabia are the world's leading groundnut producers. Asia with 25.58 million tons (58.28%) and Africa with 13.9 million tons (31.62%) reached the highest peanut production in the world. The preferred climate for groundnut is well-distributed rainfall of at least 500 mm, sufficient sunlight and relatively warm temperatures during the growing season. Temperatures of 25° to 30°C are ideal for plant growth. According to (3), the main groundnut producing zones in Nigeria are Sudan and northern Guinea savanna where the soil and agro climatic conditions which is good for the growth of the crop. The crop requires minimum rainfall of 500 to 1600 mm spanning over 70 to 200 days during the rainy season in sudan Savannah (4). Developing countries in Asia, Africa and South America accounted for 99.85% of the world's total groundnut production in 2014 (5). Groundnut is the 13th most important food crop in the world. It is an important crop in many developing countrieslike Nigeriaand serves as a source of protein, vitamin and edible oil. It is the fourth most important source of edible oil in the world and the third most important source of vegetable protein (6). The forage is a good source of feed supplements for livestock, which can increase farmers' incomes, especially when dry green grass is scarce and silage demand is high (2). As a legume crop, it is an important cash crop for farmers in poorer tropical countries and has high nutritional potentials especially for the producing countries such as Nigeria, China, India, the United States and Myanmar (7).

According to (8), developing countries account for 97% of the world's area and 94% of the world's groundnut production. In addition, the production of the crophas been reported to be concentrated in Asia and Africa, where the crops is often cultivated by small holder farmers' with little inputs in rain fed condition. In 2011, Nigeria was the third largest producer of groundnut in the world while China and India with an output of 16,114,231 6,933,000 and 2,962,760 million metric tonnes came first and second respectively.

Groundnut has significantly contributed to the economic development of the Nigerian. From 1956 to 1967, groundnut products, including cake and oil, accounted for nearly 70% of Nigeria's total export earnings making it the country's most valuable export crop ahead of other cash crops like cotton, oil palm, cocoa and rubber. Currently, it provides significant sources of income through the sale of nuts, cakes, oil and haulms (9). Due to its high protein and carbohydrate content, it plays an important role in the diet of rural people. It is also rich in calcium, potassium, phosphorus, magnesium and vitamin E. Groundnut flour, a byproduct of oil extraction, is an essential ingredient in livestock forage. Groundnut stems are widely used as livestock feed. Groundnut butter contains mixed glycerides and high amounts of unsaturated fatty acids, specifically oleic (50-56%) and linoleic (18-30%) (10). Groundnut is also important in the confectionary industry as the oil produced from groundnut is stable and preferred for deep-frying because of its high smoke point of 229.4^{o}c compared to 193.5^{o}C of soybean oil.The oil is used to make margarine and mayonnaise (11). Confectionery products like soft nuts, sauces, flour, peanut butter, and cookies are made from high-quality seeds.In the northern part of Nigeria, edible groundnuts are consumed not only whole, but are also made into other products or included as a variety of other products, including peanut paste, peanut cake (*Kuli Kuli*) and salted peanuts (*gyada mai gishiri*), a porridge made from millet and peanuts (*Kunun Gyada*),

peanut sweets (*kantun gyada*) and peanut soup (*Miyar Gyada*). Oysters are used as fuel by some local oil mills or sometimes spread in the land area as part of soil improvement. They can also be used as bulk in cattle rations or to make chipboard for attachment (12). According to (13) more than 330 products can be made commercially from groundnuts, and with a slight improvement in technology, jobs can be created directly from improved groundnut production coupled with the use of improved variety and increase in acreage. As a legume, peanuts add nitrogen to the soil thereby increasing soil fertility. Recently, the awareness for the need of growing legumes such as groundnut not only as food but also as soil fertilizer has increased. This reduces farmers' demand for inorganic fertilizers.

1.1 Problem Statement

Groundnut isconsidered to be the most popular and widely cultivated legume in Nigeria as they adapt to different climatic conditions. In developed countries, the yield of groundnut is increasing with growth, proliferation and efficient use of resources and the yield of improved varieties is 2.8 to 6.1 tonnes per hectare. However, in Nigeria, groundnut production is still as low as 0.5 to 1.0 tonnes per hectare. Groundnut production is declining, causing the popular peanut pyramids to disappear in the 1960s. Domestic and foreign markets suffer from groundnut shortages. Farmers have lost income stability as a result of poor groundnut production. Studies have shown that companies engaged in domestic use and processing and marketing lack more than 90% of the demand for peanuts (14). This is despite the efforts of various research institutes like Agricultural Research Institute (IAR) Samaru, Zaria, The National Agricultural Extension Research and Liaisons Services (NARLS) and the International Crop Research Institutes for Semi-Arid Tropics (ICRISAT) in conducting research on various aspects of crop production and improvement.Declining groundnut production in African countries is attributed to fluctuations in

rainfall and droughts, reduced soil fertility, biotic and abiotic restrictions, limited input supplies, traditional smallholders farming with little or no mechanization. It may also be due to production problems such as the incidence of pests and diseases and absence of extension services to farmers. According to (15), the declining yield of groundnut in Nigeria is generally due to factors such as unreliable rain, poor technology for smallholders, poor seed varieties, and unsupported smallholder policies that negatively impact groundnut production. Some of these factors are outside the control of the farmers, while others are under their control. Given the great potential of this cash crop, there is need to investigate the level of productivity and profitability of its production in Nigeria. Preliminary investigation reveals that there has been no record keeping of production by the farmers to know whether they make profit or not. No systematic study has investigated the cost and reurns of groundnut in Quaan-pan Local Government Area of Plateau State. Thus, the objective of this study is to assess the cost and returns of the groundnut production in Quaan-pan Local Government Area of Plateau State. The specific objectives are to determine the socio economic characteristics of groundnut producers in the study area, estimate the cost and returns of groundnut production in the study area, determine the input and output relationship in groundnut production in the study area and identify the constraints faced by groundnut farmers in the study area.

2. MATERIALS AND METHODS

2.1 Study Area

Qua'an Pan is a Local Government Area located in the southern part of Plateau State, Nigeria, with the headquarters in Ba'ap. It has coordinates 8°48′N 9°09′E, an area of 2,478 km^2 and a population of 196,929 (16). It shares boundaries with Shendam, Pankshin, Bokkos and Lafia Local Government Area of Nasarawa state. The local government has 8 districts namely; Deomak, Bwall, Kwalla, Kwa, Kwang, Kwande, Namu and Dokan-Tofa. The major ethnic groups are Geomai and Pan while other settlers include Hausa, Fulani, Igbo, Ngas and other

ethnic groups which are engaged in production and marketing of agricultural commodities. Agriculture is the mainstay of the economy of the local government area with production of major cash crops such as yam, rice, maize, millet and cassava, while the livestock reared include cattle, sheep, goat, pig and poultry. Fruit crops such as guava, cashew, citrus and mangoes are also grown in large and commercial quantities.

2.2 Sample size and Sampling Technique

Multistage sampling technique was used in drawing the sample for the study. The first stage involved the purposive selection of Quaan-Pan LGA due to the prominence of groundnut production in the area. The second stage involved a random selection of five (5) districts out of the eight districts in the study area. The four districts selected include; Kwande, Namu, Deomak, Kwang and Kwalla. From the four selected districts, thirty (30) respondents were randomly drawn from each, making a total of one hundred and fifty (150) respondents as sample size. The source of data for this study was primary data which was collected through administration of structured questionnaire to the respondents in the study area.

2.3 Method of Data Analysis

Data collected was analyzed using descriptive and inferential statistics. The descriptive statistics used include; frequency counts, percentages and mean while inferential statistics used are farm budgeting analysis and Double-log Production function.

2.3.1 Farm Budgeting Analysis

The budgetary technique was used to determine the gross margins and net farm income per hectare of groundnut farmers in the study area for 2019/2020 growing season. The Gross Margin (GM) is the difference between the value of production and that of total variable cost. The Net Farm Income (NFI) is the difference between the gross margin and the total fixed cost. The net income analysis is thus used to determine the performance of enterprise, that is, the productive component of a firm to obtain information pertaining the business strength or weakness.

The model is expressed as follows:

Gross Margin (GM) = TR-TVC

Net Farm Income (NFI) = GM-TFC

Where

TR= Total Revenue

TVC= Total Variable Cost

TFC= Total Fixed Cost

While the returns per naira invested is mathematically expressed as follows:

Returns per naira invested (RNI) = NFI/TC

Where

NFI= Net Farm Income

TC= Total Cost

2.3.3 Production Function Analysis

The general form of the production function is given below

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7 X_8, ei)$$

Double- log equation:

The double-log equation is presented as:

$$LogY = b_0 + b_1 logX_1 + b_2 logX_2 + b_3 logX_3 + b_4 logX_4 + b_5 logX_5 + b_6 logX_6 + U$$

Where

Y= Groundnut output/yield (kg/ha)

b_0 = Constant term

b_1-b_6 = Regression coefficient for X_1-X_6

X_1 = Age of farmers' (Years)

X_2 = Farm size (ha)

X_3 = Cost of agrochemicals used (₦/ha)

X_4 = Cost of fertilizer used (₦/ha)

X_5 = Cost of groundnut seeds (₦/ha)

X_6 = Cost of labour used (man-days) (₦/ha)

U = error term

3. RESULTS AND DICUSSIONS

3.1 Socio- economic characteristics

The results obtained from the study as depicted in Table 1 below reveals that, majority of the respondents representing 50% were within the age range of 30 to 40 years and 20% within the age bracket of 41-50 years. The mean age of the respondents was 38 years. This indicates that most of the farmers are young, active and energetic. The predominance of the young farmers in groundnut production is an indication that there is great potential for groundnut production in the study area. This finding is in consonance with (17) who in their study of resource use efficiency in groundnut production in Gassol Local Government area of Taraba State, Nigeria also found greater percentage of the farmers to be in their young, active and most productive ages. The age of the farmers determine their strength in farming especially where farming operations are done manually. The result also revealed that male farmers dominated groundnut production constituting 82% of the respondents. This male predominance could be because men are mostly the bread winners of their families' coupled with the fact that they are capable of handling the vigorous work involved in groundnut production. The low proportion of female farmers could be as a result of the fact that most women are into trading and due to socio-cultural factors affecting women such as unequal access and control over land as well as high cost of production inputs. The results agree with (9) who stated that farming is a male dominated profession and females are however more involved in processing of agricultural products than their male counterparts. The result in Table 1 reveals that greater (85%) percentages of respondents in the study area were married while only 15% of respondents are single. This is a usual practice where most

married people engage in farming to provide food for the family. The plethora of married people also has huge implication for family labour. The distribution of the respondents according to their educational attainment shows that 64% of them had primary education. About 17% had secondary school education, 2% had tertiary education while 16% of them had no formal education. This shows that majority of the farmers in the study area had at least one form of education. This could have a positive impact on adoption of agricultural innovation. Education is highly related to effectiveness of work and economic function. It is expected that, with this level of education of the farmers, would exposes them to some level of managerial ability in their farm business. Table 1 showed that majority representing 61% of the respondents had 6-10 persons in their households. The average household size in the study area is nine (9) persons. This is a peculiar situation in rural areas where most of these farmers believe that large family size would mean more hands to work on the farm than hiring external labour. Result from Table 1 also revealed that farmers had a mean farming experience of 9.3 years. It implies that farmers in the study area have relatively many years of farming experience and therefore might have better knowledge to make use of the various factors of production in increasing their level of productivity. Farming experience affects farming decision and could have positive relationship with technical efficiency (18). Experience in farming is important because as the farmer advances in age, he becomes more aware of his mistakes and accomplishments. This implies that the more experienced a farmer, the more efficient the farmer might be in the use of productive resources. The average farm size of groundnut farmers' is 3.0 hectares. This implies that most of the farmers were small holders and subsistence farmers, a situation that may not allow them to engage in large production and have access to bigger credit facilities. This collaborates the findings of (19) who stated that average farm size of the rural farmers is extremely low and not different from the general trend in most farming communities in Nigeria. The result also revealed that majority (72%) did not belong to any cooperative/ farming association. Only 28% affirmed their membership of farming associations. Groundnut farmers are enjoined to form cooperative society so as to pool resources together to enhance member's production capacity. The result indicates that majority of the groundnut farmers acquired their farmland by inheritance (79%) while 21% purchased or leased theirs. (20) stated that the negative effect of the majority using inherited land is that it would lead to fragmentation of farmland as a result of sharing among siblings hence reducing the size of farmland for agricultural practices. Land ownership besides

being considered as collateral, dictates the amount of money the financial institutions can offer. Borrowers face barriers securing transactions with inherited land simply because ownership rights are not formally documented. The result from table 1 indicates that the majority 68% don't have access to credit facilities while 32% of the farmers had access to credit. Farmer's access to credit would have enhanced their timely acquisition of production inputs that would have increased their productivity.

Table 1: Socio-economic Characteristics of Respondents (n=150)

Variable	Frequency	Percentage	Mean
Age (years)			
21- 30	24	16.0	
31- 40	75	50.0	
41 – 50	40	27.0	
50 above	11	7.0.0	38.0
Sex			
Male	123	82.0	
Female	27	18.0	
Marital status			
Single	22	15.0	
Married	128	85.0	
Educational level			
Primary	96	64.0	
Secondary	26	17.0	
Tertiary	3	2.0	
Non formal education	25	16.0	
Household size (number)			
1-5	41	27.0	
6-10	91	61.0	
11-15	15	10.0	
16-20	3	2.0	7.0
Size of farm land (hectares)			
1.0-2.0	62	41.0	
3.0-4.0	81	54.0	
Above 4.0	7	5.0	3.0
Years of farming			
1-5	39	26.0	
6-10	56	37.0	
11-15	31	21.0	
>15	24	16.0	9.3
Access to credit			
Yes	31	21.0	
No	119	79.0	
Land tenure			

Rent	43	29.0
Inheritance	107	71.0
Member of farm association		
Yes	42	28.0
No	108	72.0
Contact with extension agents		
Yes	64	43.0
No	86	57.0

Source: Field survey, 2020

3.2 Profitability analysis

Table 2 shows the analysis on costs and returns of groundnut production using gross margin analysis. The Gross margin analysis for groundnut production was analyzed using 2020 prevailing market prices of inputs and output as presented in Table 2. The average output obtained per hectare was 696 kg, while the average selling price/kg was ₦280. The average variable cost/ha was ₦55500 which represents 79% of the total farming cost, while fixed cost was ₦15650 representing 21% of the total cost of farming. The total variable cost incurred on production constituted the greater proportion of the total production cost implying that variable cost is the most sensitive components in groundnut production. Thus the total cost (TC) of farming operation/ha was ₦71150. The total revenue (TR), gross margin (GM) and, net farm income (NFI) per hectare are ₦194880, ₦139380 and ₦123730 respectively. The return on naira invested (RNI) by farmers in the study area was ₦1.70 indicating that for every one naira invested, ₦1.70 profit was gained. This indicates clearly that groundnut production in the study area is profitable. Therefore this should attract financing by lending institutions. This result agreed with the finding of (4) who carried out a research on the production analysis of groundnut production in Adamawa State. This result is also in agreement with the study of (18) on economic analysis of groundnut which found that ground production is a profitable business that farmers need to reckoned with. Even though, the respondents had profit, but overall, it is seen that the returns is low which might possibly be due to high cost of production. The share of labor and seeds in the total variable cost accounted for about 60% of the total operating cost. This indicates that much need to be done to reduce these costs through either innovation for a labour saving devices, effective application of agro-chemicals and encouraging farmers to multiply and use part of their seeds obtained from their farms for subsequent farming seasons. For the farmers

to make meaningful gain in the business, examination of such cost of items like labour, seeds etc. might help in revealing areas of possible wastage that need to be avoided in future.

Table 2 Estimated Average Costs and Return/hectare of Ground Production

Variable	Amount	Percentage
(A) Variable Cost		
Seeds	14750	21.0
Labour	27500	39.0
Fertilizer	7750	11.0
Herbicides	5500	8.0
TVC	55500	
(B) Fixed cost		
Land rent	8650	12.0
Farm tools	3200	4.0
Transportation	3800	5.0
TFC	15650	
Total Cost = TVC + TFC	71150	
(C) Returns		
Average yield (kg)	696kg	
Price/kg	280	
Total Revenue	194880	
Gross Margin = TR-TVC	139380	
Net Farm Income (NFI) = GM-TFC	123730	
Return on Naira invested (RNI) = NFI/TC	1.70	

3.3 Production Function of Groundnut

The result of the production function analysis shows that the double log regression model was chosen as the lead equation because it has the highest coefficient of multiple determination (R^2) of 0.895 meaning the specified factor inputs explained up to 89.5% of the variation in groundnut output and that only 10.5% was taken care by the random error term. The results of the study indicated that farm size, cost of fertilizer and cost of labour were statistically significant. Farm size being one of the most important variables was found to be positive and statistically significant at 1% level of probability indicating direct relationship with productivity. This means that a 1% increase in hectare of land under cultivation would increase output of groundnut in the study area. This also indicated that land as a factor of production is very important in groundnut production in the study area as farmers tend to derive the benefits of economies of scale. This

result is in conformity with the findings of (21) who also found a significant and positive relationship between farm size and out-put in their study on economics of groundnut production among Smallholder farmers in Michika Local Government Area of Adamawa State, Nigeria. Fertilizer is another significant input in groundnut production which was statistically significant at 1% probability level with a negative correlation. This shows that a unit increase in the cost of fertilizer would lead to a decrease in groundnut yield. This is because an increase in the cost of fertilizer would lead to a decrease in the farmers' purchasing power of fertilizer thereby leading to reduced yields.

Table 3 Input-output relationship of Groundnut Production in the Study Area

Input	Coefficient	Standard error	T-value	P-value
Constant	15.2729	3.684325	4.145373	5.79E-05
Age	-0.01535	0.073032	-0.21015	0.833853
Farm size	2.218729	0.397911	5.575937	1.19E-07***
Cost of agrochemical	0.006012	0.006549	0.918096	0.360115
Cost of fertilizer	-0.1691	0.051429	-3.28802	0.00127***
Cost of seeds	0.005763	0.00636	0.906058	0.36429
Cost of labour	-0.96054	0.397984	-2.41351	0.017065**

$R^2 = 0.895182$

Adjusted R = 0.780785

Observations = 150

Source: Field survey, 2020 *** Significant at 1%, **Significant at 5%

3.4 Constraints to Groundnut Production

The constraints to groundnut production are presented in Table 4. The result shows that high cost of inputs ranks first (64 %) as the major constraint to groundnut production in the study area. This is followed by high cost of labour (49 %), lack of organized market system (47%), land tenure (42%), lack of improved seeds (35%) and pest and diseases (31%).

High cost of inputs may be a reason why many farmers could not afford to use modern farm inputs such as high yielding seed varieties and fertilizer to obtain maximum yields. The high cost

charged on labour per man days in the study area is attributed to shortage of active labour force in the study area. The study revealed that majority of the young and energetic persons prefer migrating to the towns and cities in search of better opportunities. With respect to marketing, 47% of the farmers indicated that, they faced problem of lack of organized marketing system which resulted in the farmers selling their groundnut to middlemen which consequently hamper the profitability of the enterprise. A constraints associated with land tenure is a problem faced generally by farmers especially in areas where farmers cultivate inherited lands that are fragmented into smaller portions and shared among family members. Land tenure by inheritance as practiced in many communities may be a reason why farm size of the respondents is small. More so, the right to ownership of land and ethnic boundaries makes it hard for farmers to easily acquire land for agricultural purpose outside their cultural location. Lack of storage facilities may be attributed to the reason why farmers dispose off most of their groundnut product at the farm gate at buyers determined prices leaving the farmers' with little or no profit. Farmers also disclosed that pests and diseases infestation led to reduction in yield.

Table 4 Distribution of Respondents based on Constraints to Groundnut Production

Constraint	Frequency	Percentage
High cost of labour	96	64.0
High cost of fertilizer	74	49.0
Lack of organized market system	71	47.0
Land tenure	63	42.0
Lack of storage facilities	52	35.0
Pest and diseases	47	31.0

Multiple choice responses

5. CONCLUSION

The result of the study shows that males are more engaged in groundnut farming than females. The farmers in the study area are in their active age and literate. Groundnut farming in the study area is profitable. The problems that were found to be associated with groundnut farming in the study area include: high cost of inputs, high cost of labour, lack of organized market system, land tenure, lack of storage facilities and pest and diseases. These challenges have implications for farm yields and returns from production. The specific factors influencing theprofitability ofgroundnut productionin the study area are; farm size, cost of fertilizer and cost of labour.

6. RECOMMENDATION

Based on the outcomes of the study, thefollowing recommendations are made to improve groundnut production in the area.

i.   Having known that, groundnut production in the study area is a profitable venture, investors are encouraged to invest and participate in groundnut farming.

ii.   Policies aimed at subsidizing production inputs such as improved seeds, fertilizers etc. to the farmers would enhance output and profitability of the crop in the study area and the country at large.

iii.   Agricultural machineries/equipment services should be provided for the farmers to reduce labour input in view of its high cost in groundnut production.

iv.   Government should establish organized marketing systems where farmers will have proper and reliable linkages with buyers thereby reducing the undue exploitative tendencies of the middlemen. Moderating the activities of these middlemen will enhance more profit for the farmers.

v.   Simple and improved storage facilities should be provided so that surplus of groundnut can be stored to avoid spoilage

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