



Profitability Analysis of Sorghum Production in Riyom Local Government Area of Plateau State, Nigeria

Vihi, S.K¹, Ngu-uma, K.B² and Owa, G.T¹

¹Department of Agricultural Extension and Management, Federal College of Forestry Jos

²Department of Agricultural Extension and Communication, Federal university of Agriculture, Makurdi, Nigeria

Corresponding author e-mail: vihisam@gmail.com, 07038017410

ABSTRACT

This study examined the profitability of sorghum production in Riyom Local Government Area, Plateau State Nigeria. Multistage sampling procedure was used to select 120 farmers from all the three districts in the Local Government Area for the study. Primary data were collected through the use of questionnaires and interview schedule and were subjected to both descriptive and inferential statistics. Findings from the study revealed that the mean age of the respondents was 35 years with 60% of them being male and 66% married. The study also showed that 49.2% of the respondents had secondary education with an average of 9 years farming experience. The gross margin and net farm income were N56, 500.40 and N49030.40 respectively. The result shows that the return to naira invested was 0.91 which implied that for every naira invested in sorghum production, a farmer makes a profit of N0.91. The result of the stochastic frontier production function analysis shows that farm size had a positive coefficient and was significant at 1% level of probability. Fertilizer cost was also statistically significant at 1% level of probability, and had a positive coefficient. Major constraints to sorghum production were high cost of fertilizer (31.7%), lack of improved seeds (29.1%), inadequate capital (27.5%) and lack of extension support (26.6%). The study recommends that sorghum stakeholders and research institutes should work more on introducing new improved sorghum varieties. Government should subsidize sorghum inputs like recommended fertilizer and herbicides so as to motivate farmers to grow sorghum.

Keywords: Profitability, Analysis, Sorghum, Production, Riyom

INTRODUCTION

Sorghum is the fourth most important world cereals crop following wheat, rice, and maize. It is a staple food in the drier part of Africa, China and India (Zalkuwi *et al.*, 2013). It is the world's fifth largest grain crop and it is second most important crop in terms of tonnage in Africa (Thabit, 2015). Nigeria is the largest producer in Africa, its production represents 71% of the total sorghum output in the region and ranked third as the largest world producer of sorghum after the United States and India (FAOSTAT, 2012). In almost all parts of the Northern Nigeria, it is grown in large quantity and used as the primary food crop in diverse forms. It is industrially used for brewing alcoholic and non-alcoholic drinks and other confectionery in Nigeria. Researchers have also reported health benefits of sorghum as strong anti-proliferative activity against colon cancer cells and has higher antioxidants compared to other grains and fruits and slows the growth of cancer generally in human (Oyediran *et al.*, 2017). However, the huge potentials of sorghum as household food, income generation and raw materials for livestock feed and industries have been constrained by continuous reduction in its annual production in Nigeria due to climate change, production and socio-economic factors, and insecurity. Rural farmers are therefore wallowing in abject poverty despite their effort and commitment to agriculture as a means of living. Zalkuwi *et al.*, (2013) reported that production has been declining due to the strong reduction of both area harvested and yields since 2013 till date and making it difficult for farmers to realize higher income and move out of poverty.

Nigerian small-scale farmers are characterized by the use of unimproved inputs and traditional production tools that are capable of generating only a low level of income. This low income of the farmers leads to low levels of savings and investments, which leads to low productivity and low income (Baiyegunhi and Fraser, 2010). Poverty contributes to poor agricultural productivity, as many rural farmers in Nigeria cannot afford to purchase the necessary farm inputs such as fertilizers, pesticides and improved seeds, which would bring about increased productivity. Many rural farmers sell their farm produce at give-away prices regardless of the cost of production. They do this in order to meet some pressing needs of their families thus remaining in perpetual poverty. They hardly break-even not to talk of making profit. Most farmers do not realize that their family labour constitutes a portion of the production cost and they continue to get unfair market prices for their produce seasonally. Sorghum is a high-value crop with low cost inputs relative to other crops such as maize and wheat which should translate into a profitable enterprise preferred by resource poor smallholder farmers. This however, does not appear to be the case. Rural farmers have not harnessed the potential benefits derived from growing sorghum and there is need for research to clearly establish the viability or otherwise of the sorghum enterprise in order to assist farmers with enterprise choice decisions. Socio-economic factors that affect the viability and profitability of the sorghum enterprise are not easily apparent to rural dwellers. The small holder farmers are generally less knowledgeable and take these factors for granted. Hence the need to analyse the profitability of this enterprise and establish the factors that affect its profitability becomes even more compelling. The broad objective of the study is to estimate the profitability of sorghum production in Riyom Local Government Area of Plateau State, Nigeria. The specific objectives are to: identify the socio-economic characteristics of sorghum producers, determine the input and output relationship in sorghum production in the study area, determine the cost and returns of sorghum production in the study area and to identify the constraints associated with sorghum production in the study area.

MATERIALS AND METHODS

Riyom local government area (LGA) is located between Latitude 9° 19' to 9° 39' North and Longitude 8° 19' to 8° 39' East. It is bounded by Bassa and Jos South Local Government Areas to the north-east, Barkin-ladi to the south-west and Kaduna State to the west. It covers a landmass of 768.75 square kilometres and is divided into 3 districts namely; Riyom, Bachit and Ganawuri districts. Using the growth rate of 2.8% for Plateau, the projected population of the area is given as 155,526 people. There are two distinct seasons in the study area; the dry and the rainy seasons. The former starts from April and ends in November of each year, while the later starts from November and ends in March every year. Usually, the cold harmattan wind dominates February to March annually. The major occupation is agriculture due to the vast land available and fertile nature of the soil.

Multi-stage sampling technique was employed in this study. The first stage involved a selection of the existing three (3) districts, that is, Riyom, Bachit and Ganawuri districts. In the second stage, two communities known for high production of sorghum were purposively selected from each of the three districts giving a total of six communities for the study. These included; Hoss and Werreng communities from Riyom district; Sharubutu and Fang communities from Bachit district while from Ganawuri district, Fangroi and Bum were selected. The third stage was the random selection of twenty sorghum farmers from each of the six communities giving a total of 120 respondents for the study. Primary data were obtained through field survey using structured questionnaire. Descriptive statistics, Double-log Production function and Gross margin analysis were adopted to achieve the objectives of the study.

Model Specification

The general form of the production function are given below

$$Y = f(X_1, X_2, \dots, X_n, U)$$

Double- log equation:

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + \log e$$

Where,

Y = Output of groundnut (N)

X_1 = Seeds (N/ha)
 X_2 = Farm size (N/ha)
 X_3 = Labour (N/ha)
 X_4 = Herbicides (N/ha)
 X_5 = Fertilizer (N/ha)
U = Error term

Gross Margin Analysis

Objective (ii) was achieved with the use of gross margin. The model is presented as below;

$GM = TR - TVC$

$NFI = TR - TC$,

$TC = TVC + TFC$

$ROI = NFI/TC$

$BCR = TR/TC$

Where:

GM = Gross margin

NFI = Net farm income

TC = Total cost

ROI = Return on investment

BCR = Benefit cost ratio

TVC = Total variable cost

TR = Total revenue

RESULTS AND DISCUSSION

Socio-economic characteristics of sorghum farmers

As shown in Table 1, the mean age of sorghum farmers in the study area is 35 years. This portrays that most of the sorghum farmers are in their active and productive age when they can put in their best for optimum productivity. This collaborates the findings of Zakuwi *et al.*, (2014) who found that Sorghum production is undertaken mostly by middle age persons who are still active in Guyuk LGA of Adamawa State, Nigeria. Gender of the respondents reveals that majority (60.0%) of the farmers were male. This 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 sorghum production while the low percentage of women involvement may be explained by socio-cultural factors affecting women such as unequal access and control over land as well as high cost of production inputs. The result in Table 1 reveals that greater (66.6%) percentages of respondents in the study area are married while 33.3% of respondents are single. This might be attributed to the fact that married people take farming seriously in order to augment their household income. Result from Table 1 also shows that the mean household size of sorghum farmers in the study area is 8 persons. This is a peculiar situation in rural areas as most of these farmers believed that it is better to have more children who would work on the farm than hiring external labour. Farmer's educational attainments showed that (49.2%) of the farmers had secondary education, 35.0% had tertiary education. 14.2% had no formal education while 1.7% of them attained primary education. This in effect 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. Table 1 also reveals that sorghum farmers in the study area have a mean farming experience of 9 years. It implies that farmers in the study area have long years of experience in farming and therefore might have better knowledge to make use of the various factors of production in increasing their level of productivity. The mean farm size of sorghum farmers in the study area 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. A greater percentage (62.5%) of the respondents said they acquire their farmlands through inheritance. The negative effect of majority using inherited land is that it would lead to fragmentation of farm land as a result of sharing among siblings hence reducing the size of farm land for agricultural practices. Majority (67.5%) of the

respondents were not members of any farmers association. The membership of associations or cooperatives could avail farmers the opportunity to obtain credit, receive inputs and obtain information on important and recent information concerning their farming activities. Result also shows that majority (69.2%) of the farmers in the study area had no contact with extension agent last planting season. Extension is one of the major tool through which agricultural innovations are transmitted to practicing farmers. The result indicates that majority (67.5%) of the farmers had no access to credit for agricultural production. Farmers' access to credit would have enhanced their timely acquisition of inputs that would have increased their productivity.

Table 1: Socio-economic Characteristics of the Respondents (n=120)

Variable	Frequency	Percentage	Mean
Age			
20-30	34	28.3	
31-40	62	51.7	
41-50	22	18.3	
>50	2	1.7	35
Gender			
Male	72	60.0	
Female	48	40.0	
Marital status			
Single	40	33.3	
Married	80	66.7	
Household size			
1-5	28	23.3	
6-10	72	60.0	
11-15	14	11.7	
>15	6	5.0	8
Years of farming experience			
1-5	21	17.7	
6-10	70	58.3	
11-15	16	13.3	
>15	13	10.8	9
Educational status			
Primary	2	1.7	
Secondary	59	49.2	
Tertiary	42	35.0	
Non formal	17	14.2	
Farm size			
1-2.0	40	33.3	
2.1-4.0	63	52.0	
>4	17	14.2	3.0
Land Tenure			
Hired	38	31.7	
Inheritance	75	62.5	
Purchased	7	5.8	
Membership of association			
Yes	39	32.5	
No	81	67.5	
Contact with extension agents			
Yes	37	30.8	
No	83	69.2	
Access to credit			
Yes	39	32.5	
No	81	67.5	

Cost and returns analysis of sorghum production per hectare

The gross margin analysis for sorghum production in Table 2 shows that the total variable cost of production per hectare was N46, 145.00 which accounted for 92.4% of the total cost of sorghum production. The average fixed cost was N7, 470.00 which account for 7.6 % of the total cost of production. Thus the total cost of production stood at N53, 615.00. The result shows that average yield of the sorghum per hectare in the study area was 789.58kg. The monetary value at a prevailing price of N130 stood at N102, 645.40. The table further revealed that the gross margin and net farm income were N56, 500.40 and N49030.40 respectively. The result shows that the return to naira invested was 0.91 which implied that for every naira invested in sorghum production in Riyom LGA a farmer will make a profit of N0.91. This is in consonance with the findings of Zalkuwi *et al.* (2014) who found that sorghum production in Guyuk Local Government of Adamawa State, Nigeria is profitable.

Table 2. Cost and Return analysis of Sorghum Production (N/ha)

Variables	Amount (N/ha)	Percentage
(A) Variable cost		
Seeds	5300.00	9.88
Labour	12650.00	23.59
Fertilizer	20,650.00	38.51
Herbicides	7400.00	13.80
Total Variable Cost	46145.00	
(B) Fixed Cost		
Rent on land	6600.00	12.30
Depreciation on farm tools	870.00	1.62
Total Fixed Cost	7470.00	
Total Cost	53615.00	
(Returns)		
Crop output	789.58	
Price/kg	130.00	
Total Revenue (TR)	102645.40	
Gross Margin (GM) - (TR-TVC)	56500.40	
Net Farm Income (NFI) – (GM-TFC)	49030.40	
Return to naira invested	0.91	

Production Function

The result of the stochastic frontier production function analysis presented in Table 3 shows that the variance parameter sigma squared (δ^2) was statistically significant at 5% level of probability. The t-ratio of the regression was significant at 1% level of probability indicating that the model is appropriate. From the result, farm size had a positive coefficient (4.5845) and was significant at 1% level of probability. This implies that a unit increase in the farm size when other variables are held constant will result in 4.5845kg increase in yield of sorghum. Fertilizer cost was also statistically significant at 1% level of probability, and had a positive coefficient (1.3157). This implies that an increase in quantity of fertilizer used will increase the output of the farmers.

Table 3. The influence of production input cost on the output

Variable	Coefficient	Standard error	T-Value	P- Value
Constant	-16.82076	10.07694	-1.67	0.095
Seeds	1680269	1.847992	0.09	0.928
Farm size	4.584516	1.756451	2.61	0.009***
Labour	-.3755991	.6779584	-0.55	0.580
Herbicides	2.444728	1.780489	1.37	0.170
Fertilizer	1.3157	-4188804	3.14	0.002***

*** = Significant at 1%

Constraints to sorghum production

The constraints to sorghum production are presented in Table 17. The results shows that high cost of fertilizer ranked first with 31.7% followed by lack of improved seeds (29.1%), inadequate capital (27.5%), Lack of extension support (26.6%), pest and disease (14.1%), high cost of herbicides (10.8%), high cost of labour (8.3%), poor storage facilities (5.8%) and others (1.7%). Despite these challenges, the farmers made appreciable profit.

Table 4. Distribution of Respondents according to constraints faced in sorghum production

Constraint	Frequency	Percentage	Rank
High cost of fertilizer	38	31.7	1 st
High cost of herbicides	13	10.8	6 th
High cost of labour	10	8.3	7 th
Inadequate capital	33	27.5	3 rd
Lack of extension contact	32	26.6	4 th
Lack of improved seeds	35	29.1	2 nd
Pest and disease	17	14.1	5 th
Poor storage facilities	7	5.8	8 th
Others	2	1.7	9 th

Multiple Responses

CONCLUSIONS

Findings from the study revealed that farm size and cost of fertilizer were significant determinants of sorghum production in the area. The gross margin and net farm income were N56, 500.40 and N49030.40 respectively. The result shows that the return to naira invested was 0.91 which implied that for every naira invested in sorghum production in Riyom LGA a farmer will make a profit of N0.91. Major constraints to sorghum production were high cost of fertilizer, lack of improved seeds, inadequate capital and lack of extension support. Despite these challenges, the farmers made appreciable profit.

RECOMMENDATIONS

Research institutes in Nigeria should work more on introducing new improved sorghum varieties to enhance productivity of farmers. Government should subsidize sorghum inputs like recommended fertilizer, herbicides and insecticides so as to motivate farmers to grow sorghum. Financial institutions such as the banks and other agricultural agencies should be encouraged to make credit facilities available and affordable to the farmers. Plateau State Agricultural Development Projects/Programmes should improve extension visits to the sorghum farmers.

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