



PROFITABILITY ANALYSIS OF SORGHUM SMALL-SCALE FARMERS IN SELECTED LOCAL GOVERNMENT AREAS OF GOMBE STATE, NIGERIA

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ABSTRACT

The study aims at estimating the profitability of small-scale farmers in sorghum production, using the gross margin model of determining profitability in some selected Local Government Areas of Gombe State, Nigeria. Primary data was used for the study. Data were collected with the aid of structured questionnaire administered to 234 sorghum farmers in the study area. The data were analyzed using descriptive statistics and gross margin. The average age of sorghum farmers was found to be 40 years implying that farmers can make positive contribution to agricultural production. Household size is between 11-15 persons in their family with average of 12 persons. 48 percent of the farmers had no formal education. The total variable cost (TVC) incurred and revenue obtained per hectare for sorghum was estimated to determine the profitability of sorghum production in the study area. The total revenue (TR) was ₦354,946.6 while the total variable cost (TVC) was ₦167,188.6. The gross margin was therefore ₦187,758. The rate of return on investment (return per Naira invested) was ₦2.12 indicating that for every ₦1 invested in sorghum production in study area; a profit of 1.12 kobo was made. The eight major constraints associated with sorghum production ranked in order of importance were cost of fertilizer, inadequate capital, cost of labour, inadequate improved seed, pest and diseases, weed infestation, inadequate extension workers and inadequate storage facilities. The constraints were reported by 80%, 76%, 51%, 46%, 36%, 35%, 30% and 13% of the sorghum farmers, respectively. It was recommended that farmers should be encouraged to join cooperative societies in order to enhance loan accessibility to increase production and to have market linkages to commercialize their output thus increasing the profit level.

Keywords: Profitability, Analysis, Gombe State, Gross margin, Sorghum.

INTRODUCTION

Sorghum (*Sorghum bicolor* (L.)) is a widely grown cereal grain in Nigeria; According to the Food and Agricultural Organization (FAO, 2019), Nigeria is the largest producer of sorghum in West Africa accounting for about 71 percent of the total regional sorghum output and ranks the second largest producer of sorghum in the world. The crop is well adapted to the ecological conditions which it is traditionally grown (Muyukani and Muthama, 2019). Sorghum is a very competitive crop and does well in competing with weeds in narrow rows (Food and Agriculture Organization Statistics [FAOSTAT], 2018). Its growth habit is similar to that of maize. It has a waxy coating on its leaves and stems which helps to keep water in the plant even in intense heat. Sorghum is an environmentally-friendly food and industrial grain in Nigeria.

The largest groups of producers are small-scale subsistence farmers with minimal access to production inputs such as fertilizer, pesticides, improved seeds (hybrids or varieties), and inadequate technical know-how; The lack of initial processing facilities, has undermine the



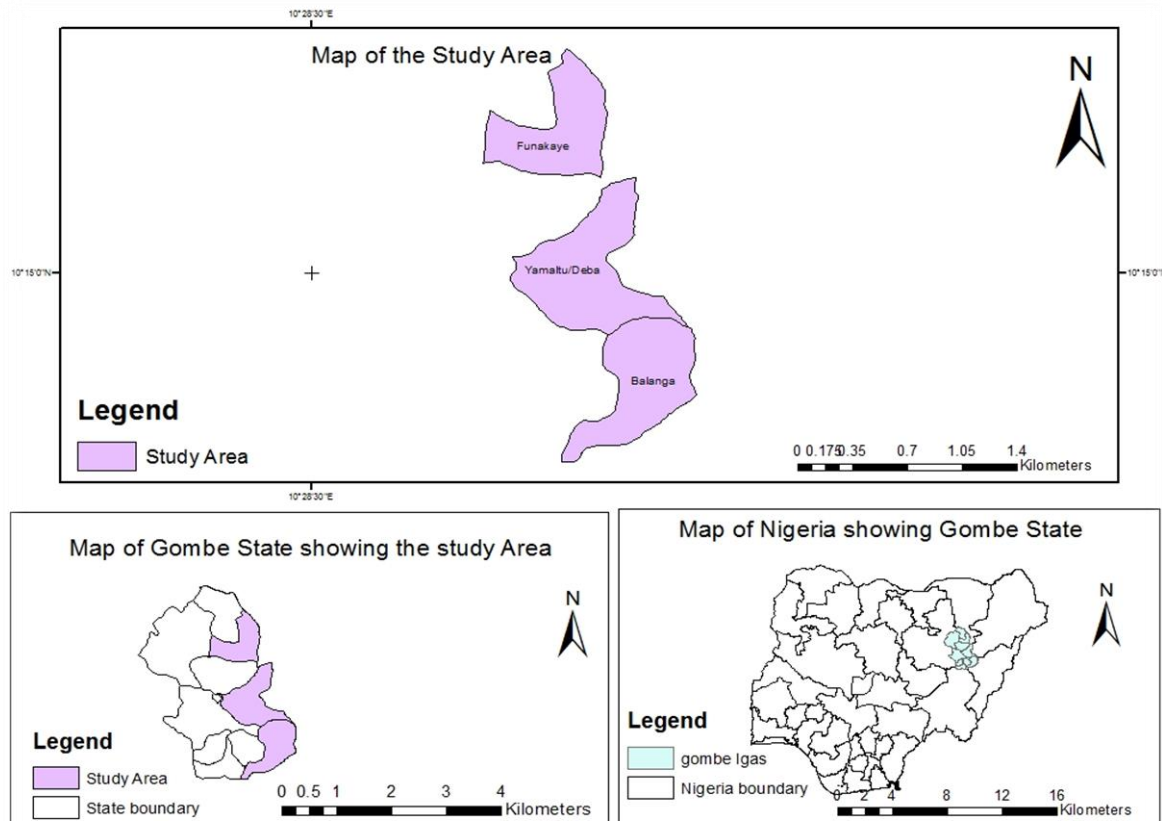
marketability of sorghum for both local consumption and for export, and even when they are available, the quality of the grain is sometimes unattractive, and when purchased, are under-priced (Ogidi and Abah, 2012). Many sorghum farmers sell their farm produce at give-away prices regardless of the cost of production. They do this in order to meet some pressing needs of their families; thus, they hardly break-even not to talk of making profit (Vihi, Ngu-uma and Oma, 2019). Gombe State is one of the major producers of Sorghum in Nigeria (Onome Amge, 2021), but the profitability level in sorghum production is low because they produce at subsistence level therefore, farmers are not making profit enough to expand their production beyond subsistence need. The small-scale farmers are generally less knowledgeable about the commercial aspect of sorghum production and hence farmers don't think beyond the subsistence level of production. Improving the productivity of small-scale sorghum farmers is important for economic development because small scale farmers provide a source of employment and a more equitable distributive expensive and lack of efficiency among sorghum farmers, affects sorghum production.

MATERIALS AND METHODS

The Study Area

The study was conducted in Funakaye, Balanga and Yamaltu Deba Local Government Area (LGA) of Gombe State, Nigeria. Funakaye Local Government Area of Gombe State has a land mass of 1,415 km² and a population of 236,087 at the 2006 population census with a projected population of 434,067 in 2020 at an annual growth rate of 4.35 percent. Its headquarters are in the town of Bajoga. Funakaye is bounded in the east by the Gongola River and lake Dadin Kowa. Funakaye lies on 10° 51'N 11°26'E. It is made up of predominantly Fulani and other minorities. The religion mostly practice is Islam and Agriculture is their major source of occupation. The LGA is blessed with abundant agricultural land and was estimated that 65 (65%) of the total land area is cultivable.

Balanga Local Government Area of Gombe State has a land mass of 1,626 km² and a population 212,549 at the 2006 population census with a projected population of 390,790 in 2020 at an annual growth rate of 4.35 percent. The LGA is bordering Adamawa State. Balanga lies on 9° 58'N 11°41'E. It's headquarter are in the town of Tallase. 45% of the populations are Muslims and the major speaking language is Waja. Agriculture is their major source of occupation. The LGA is blessed with abundant agricultural land. Yamaltu Deba Local Government Area of Gombe State has a land mass of 1,981 km² and a population 255,248 at the 2006 population census with a projected population of 469,296 in 2020 at an annual growth rate of 4.35%.



Sampling Procedure

A multi-stage sampling procedure was used for the study. The first stage involves purposive selection of One Local Government Areas (LGA) each from the Three Agricultural Zones in Gombe State based on the predominance of sorghum production in the zone. The three LGA are Funakaye, Balanga and Yamaltu-Deba. Random selection through balloting method was used to select Six villages; Two villages from each LGA making the total villages to be Six. The six villages include; Bajoga, Tongo, Talasse, Balanga, Dassa and Kuri. Slovin's formula was used for calculating sample size based on the assumption of 5 percent expected margin of error, 95% confidence interval and applying the finite population correction factor. Expressed as

$$S = \frac{N}{1+N(e)^2} \quad \dots(1)$$

where;

N = sample frame

e = level of significance desired

1 = constant

S = sample size

A simple random sampling was employed in selecting respondents from each of the villages. 42 percent of the sample frame 555 was used as the sample size. In all, 234 farmers were randomly selected using balloting method.

$$\frac{232}{555} \times 100 = 42\%$$

$$S_z = 555 / 1 + 555(0.05)^2$$



$$S_z = 555/2.39$$

$$S_z = 234$$

Table 1: Selected LGA and Sample size of farmers

LGA's	Villages	Sample frame	Sample size 42%
Unakaye	Bajoga	119	50
	Tongo	85	36
Balanga	Talasse	70	29
	Balanga	80	34
Yamaltu Deba	Dasa	125	53
	Kuri	76	32
Total		555	234

Source: Gombe State Agricultural Development Programme (GSADP, 2021)

Method of Data Collection

Primary data was used for this study; the primary data pertaining to this study was collected using a structured questionnaire. To facilitate the collection of the data, the services of enumerators was engaged. The data collected include: socio-economic characteristics of the sorghum farmers, such as age, sex, educational level, household size, farming experience, marital status, access to credit, membership of cooperative societies and contact with extension agents.

Analytical Techniques

Descriptive statistics such as percentages, frequency, arithmetic means and standard deviation was used to describe the socio-economic characteristics of sorghum farmers in the study area. The gross margin analysis was used to measure the profitability of sorghum producers in the study area. The model is specified as thus:

$$GM = TR - TVC \quad \dots(2)$$

where;

GM = Gross margin (Naira)

TR = Total revenue (Naira)

TVC = Total variable cost (Naira)

$$RNI = TR/TVC \quad \dots(3)$$

where;

RNI = Return per naira invested

RESULTS AND DISCUSSION

Socio-economic Characteristics of Sorghum Farmers

The socio-economic characteristics of sorghum farmers are presented in Table 2. The study reveals that 34% of sorghum farmers were within the age range of 40-49 years. The average age of sorghum farmers was found to be 40 years; with the standard deviation of 10.5. It implies that the age of sorghum farmers in the area are close to the average mean age of the farmers, it agrees with the findings of Gifty *et al.* (2021), that most farmers are within their



active years and can make positive contribution to agricultural production. Table 2 reveals the modal range of household size is between 11-15 persons in their family with average of 12 persons. This implies that the farmers in the study area might have advantage of family labour availability if many household members participate in farms. However, the implication of large household size is that it will increase household consumption expenditure which would compete with production for limited financial resources within the household. According to Babangida (2016), there is a positive and significant relationship between household size and farmers' efficiency in production. However, the absolute number of people in a certain family cannot be used to justify the potential for productive farm.

The result in Table 2 also shows that 48 percent of the farmers had no formal education, 17% of the respondent had only primary education, 19% had secondary education and 18% had tertiary education. It implies that sorghum farmers in the study area had one form of formal education or the other. Education is an important socio-economic factor that influences farmer's decision making because of its influence of farmers' awareness, perception and adoption of innovations that can bring about increase in productivity. The result shows that 28% of sorghum farmers in the study area had experience in the sorghum production from 6-10 years, Farmers with more years of farming experience have been observed to have higher farm output than those with lesser years of farming experience.

Result in Table 2 also reveals that majority (74%) of sorghum farmers have farm size ranging from 1-5 hectares with an average of 4.5 hectares. This show that majority of the farmers have small farm sizes and will not be able to enjoy economics of scale in production. Consequently, small farm size is an impendent to agricultural mechanization because using farm machineries like tractor will be difficult. Small farm sizes might be as a result of the fact that most of the farmers got their land through inheritance.

The average years of membership of cooperative society was approximately 6 years, with a modal class range of 6-10. This implies that farmers had opportunity of interacting with other farmers to enhance diffusion of innovations among the farmers. Hassan (2014) observed that membership of association was positively related to technical efficiency, and resulted in increase in output.

Table 2 reveals that 87% of sorghum farmers in the study area had no contact with extension service. This implies that there is low extension - farmers contact in the study area. It is expected that extension services should enhance sorghum farmers' ability to efficiently utilize resources through the adoption of improved methods used in sorghum production in the study area (Sani and Oladimeji, 2017).

Table 2 shows that about 80 percent of the farmers financed their sorghum production from personal savings, 6.8% sourced their credit through formal sources. 9.4 sourced their credit through informal source like family and friends, while 3.4 sourced credits from money lenders. The low access to credit could be attributed to the fact that government rarely grants financial credit to farmer. Sani and Oladimeji (2017) in their studies on determinant of technical efficiency among sorghum farmers under the Agricultural Transformation Agenda in Gombe State, asserted that credit is a very strong factor that is needed to acquire or develop any enterprise. Its availability could determine the extent of production capacity. Similarly, Hassan (2014) reported a positive relationship between credit and technical efficiency. This implies that farmers who have access to credit tended to be more efficient in production.



Table 2: Socio-economic characteristic of sorghum farmers

Variables	Modal class range	Frequency	Percentage	Std. dev.	Mean
Age Years	40-49	80	34	10.5	40
Households size	11-15	56	24.00	6.3	12
Level of Education					
No formal Education		27	48.00		
Primary Education		40	17.00		
Secondary Education		45	19.00		
Tertiary		42	18.00		
Farming experience	6-10	9	28.00	10.1	16
Farm Size	1-5	173	74.00		4.5
Years of coop Membership	6-10	173	74.00	2.9	5.53
Extension Contact		28			
No Contact		204	87.00		
1-5		27	12.00		
Access to Credit					
No access		188	80.3		
Formal source		16	6.8		
Friends and family		22	9.4		
Money lenders		8	3.4		

Measurement of profitability in Sorghum production

Gross margin analysis was carried out so as to determine the level of profit associated with sorghum production in the study area. The result is presented in Table 3. The analysis revealed total revenue (TR) of ₦354,946.6 per hectare and a total variable cost of (TVC) production ₦167,188.6 per hectare thus, the gross margin realized is ₦187,758. This shows that sorghum production in the study area is profitable to the tune of ₦187,758 per hectare. The total cost of production consists of the costs of fertilizer, seed, agrochemicals, labour. Among the variable costs recorded by the sorghum producers, labour recorded the highest with a cost of ₦101,928.6 representing 61 percent of the total cost of production per hectare. This was followed by fertilizer with a cost of ₦48,114 representing 28.8 percent. From the result, it shows that more profit will be made in sorghum production if the cost of labour and fertilizer is reduced.

Findings by Vihi, Ngu-uma and Oma (2019) have shown that sorghum production in Riyom Local Government Area of Plateau State, Nigeria is profitable with a gross margin of ₦56,500.40 per hectare. Table 3 further shows the average rate of return on investment per hectare (return per naira invested per hectare) was ₦2.12, indicating that for every ₦1 invested in sorghum production a profit of 1.12 kobo was made as profit. Thus, it could be said that sorghum production in the study area though on a small scale, was profitable.



Table 3: Average cost and return per hectare of sorghum production

Variable	Value (₦)	Unit price(₦)	Percentage
a. Total Revenue (TR)	354,946.6		
b. Variable Costs			
i. Seed (kg)	4,882	120/kg	2.9
ii. Fertilizer (kg)	48,114	6,900/bag	28.8
iii. Agrochemical (litre)	12,264	1600/litre	
iv. Labour (man-days)	101,928.6		7.3
c. Total Variable cost(TVC)	167,188.6		
e. Gross Margin(TR-TVC)	187,758		61
d. Return to Naira invested (TR/TVC)	2.12		100

Constraints to Sorghum Production

The problems faced by sorghum farmers in the study area were ranked according to their magnitude as stated by the farmers (Table 4). The problem of fertilizer cost was the most severe constraint of sorghum production with about 80% of the farmers attesting to this fact. Fertilizer is an important input in crop production been that it replenishes the fertility of the soil. However, it is not extensively used in the study area due to its high price; this makes most farmers not being able to meet up with the recommended level of application of the input, this result in yield generally being low. Also, 76% of the sorghum farmers indicated inadequacy of capital and credit facilities which rank second, affects sorghum production in the study area, because the savings the farmers might have made or the funds generated from personal savings is not sufficient to satisfy various activities in sorghum production. Most of the farmers also complained of not having enough money to purchase farm inputs.

The result also revealed that 51% of the sorghum farmers indicate cost of labour as constraints in the study area. According to the farmers, during active period of production, every household would have been engaged in his family farm work. The demand for labour is normally very high and expensive during the peak period of land clearing, ridging, harvesting, processing and weeding; and these led to high cost of labour in sorghum farming in the study area.

About 46% of sorghum farmers indicated inadequate improved seed is also one of the constraints to sorghum production which is ranked fourth. Most of the farmers used seeds gotten from previous harvest instead of using improved seed. Seed is the single most important input in crop production. It carries the genetic potential of the variety and determines the ultimate productivity of other inputs. Pest and disease ranked fifth which are responsible for pre-harvest and post-harvest losses by sorghum producers. This affects sorghum production in the study area as it causes low productivity of the farmers. Babangida (2016) noted that pest and disease infestation constituted 69% of yield reduction.

Weed infestation ranks sixth as attested to by the farmers as affecting sorghum production in the study area. Directly or indirectly, weeds reduce sorghum productivity. Inadequate extension worker to disseminate new ideas and innovation to sorghum farmers is ranked seventh as one of the problems affecting sorghum production. Inadequate extension services limit awareness of the availability of improved sorghum varieties and improved production technology currently available at the research stations.



Table 4: Constraint to sorghum farming

Variables	*Frequency	Percentage	Rank
Cost of Fertilizer	188	80	1 st
Inadequate capital	178	76	2 nd
Cost of labour	121	51	3 rd
Inadequate improved seed	108	46	4 th
Pest and diseases	85	36	5 th
Weed infestation	84	35	6 th
Inadequate extension workers	71	30	7 th
Inadequate storage facilities	30	12.8	8 th

*Multiple Response was allowed

CONCLUSION AND RECOMMENDATIONS

Given that sorghum is an important staple food in Nigeria, any attempt to increase its productivity would be a right step towards combating food crises.

Also based on the findings, it can be concluded that the cost of input variables influencing sorghum output were Farm size, fertilizer, manure, agro chemicals and labour. These results imply that in order to improve profit level in sorghum production, there is need to reduce the cost of major variable inputs. the average rate of return on investment per hectare (return per naira invested per hectare) was ₦2.12, indicating that for every ₦1 invested in sorghum production a profit of 1.12 kobo was made as profit suggests that; some gap exist for farmers to increase their level or amount of profit.

The following recommendations were made based on the findings of the study:

1. Most of the sorghum small scale farmers had no Cooperative membership thus, cannot access low interest financial loans through cooperative membership. Hence farmers should be encouraged to join cooperative societies in other to enhance loan accessibility to increase production and to have market linkages to commercialize their output thus increasing the profit level.
2. Investment in extension service is critical to increase the level of profit in Sorghum production. There should be improved extension linkages to sensitize sorghum farmers on the need to adopt the recommended practices for sorghum production

REFERENCES

- Babangida, A. U. (2016). *Profitability and Production Efficiency in Cotton Production in North-West Nigeria*. Msc. Dissertation. Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria.
- FAOSTAT (2019): Food and Agriculture Organization of the United Nations. Retrieved from <http://faostat.fao.org/site/567/default.aspx//ancor>
- FAOSTAT (2018): Food and Agriculture Organization of the United Nations. Retrieved from <http://faostat.fao.org/site/567/default.aspx//ancor>
- FAOSTAT (2017): Food and Agriculture Organization of the United Nations. Retrieved from <http://faostat.fao.org/site/567/default.aspx//ancor>
- Hassan, A. A. (2014). *Analysis of Profitability and Production Efficiency of Poultry Egg Enterprises in Kaduna State, Nigeria*. Unpublished Ph.D. Thesis. Department of Agricultural Economics and Rural Sociology. Ahmadu Bello University Zaria, Nigeria.



- Muyukani, W. P. and Muthama, N. J. (2019). Factors influencing household production of sorghum and millet in Kiminini sub-county of Trans-Nzoia county, Kenya. *Journal of Sustainability, Environment and Peace*, 1(1), 25–31.
- Onome, A. (2021). Exploring wealth potential in Nigeria's sorghum production. *An article of business a.m.*
- Sani, A. A. and Oladimeji, Y. U. (2017). Determinants of Technical Efficiency among Sorghum Farmers under Agricultural Transformation Agenda in Gombe State Nigeria. *Nigerian Journal of Agriculture, Food and Environment*, 13(3), 122–127.
- Vihi, S. K., Ngu-uma, K. B. and Owa, G. T. (2019). Profitability Analysis of Sorghum Production in Riyom Local Government Area of Plateau State, Nigeria. *International Journal of Innovative Food, Nutrition and Sustainable Agriculture*, 7(4), 22-28.