



Full Length Research Paper

## An Economic Analysis of Sorghum Production among Sorghum Farmers in Kwara State Nigeria

<sup>2</sup>Aduba\*, J. J., <sup>1</sup>Mohammed, B. T., Jilasaya, I., <sup>1</sup>Ozumba, I. C.

1. Department of Agro-industrial and Extension Services, National Centre for Agricultural Mechanization, NCAM, P.M.B, 1525, Ilorin, Kwara State, Nigeria.

2. Department of Computer and Statistics, National Centre for Agricultural Mechanization, NCAM, P.M.B, 1525, Ilorin, Kwara State, Nigeria.

*\*Corresponding author: Aduba, J. J*

---

### Abstract

The study examined the economic analysis of sorghum production in Ifelodun Local Government Area of Kwara State, Nigeria. The specific objectives were to identify the socio-economic characteristics of the respondent, estimate cost and returns, efficiency of resource use, input-output relationship and constraints associated with sorghum production. Primary data were used for the study. They were obtained through interview schedule. A total of 226 households engaged in sorghum production were investigated. Data collated were analyzed using suitable statistical tools such as descriptive statistics, budgetary analysis, multiple regression analysis and resource use efficiency models. Results from the analyses revealed that majority of the farmers were aged, married, experienced and have the ability to read and write. The regression analysis showed that variable inputs such as fertilizer, quantity of seed, chemical, labour and input cost, significantly affect sorghum production in the study area while input variables such as farm practice and farm experience does not show any significant relationship. Significant input variables are determinants of sorghum production in the study area. High cost of labour, inadequate fund, lack of access to extension services and improved seeds were some of the problem affecting sorghum production in the study area. The study recommends access to credit facilities, improved seeds, extension services and encourage farmers to keep farm records.

**Key words:** Agriculture, Farmers, Production, Sorghum.

---

### Introduction

Agricultural development is the foundation for economic development, and agricultural sector is the prime area of consideration for economic progress. A review of the past performance of agriculture since 1970 in Nigeria clearly shows that it contributes more than 30% of the annual Gross Domestic Product (GDP), employs about 68% of the labour force accounts for over 70% of the non-oil exports, and provides over 80% of the food needs of the country (Adegboye, 2004).

In Nigeria, Agricultural contribution to the GDP and exports has been low since the 1980s and food imports continued to rise in value. In terms of relative importance, food import as a percentage of total imports rose from 3.5% in 1991 to 11.8% in the year 2000 (CBN, 2000; Akosile, 2003; Nyako, 2006). Nigeria has witnessed a considerable decline in food production and a widening gap in the supply and demand brought about by population growth of about 3.5% per annum relative to food production growth of about 15% per annum (Gulai, 2000; Yai'aishe Modu, 2010).

By 2003, the agricultural growth rate was 2.8% (PCU/FMARD, 2004), yet this growth rate is still lower than expected. Although, opinions differ on the magnitude of Nigeria's food problem, at the national level, the main food problems are food supply deficits, poverty and uneven distribution of income in terms of ability to buy food (Ohajianya, 2004). This brought about a distortion of the labour market and distribution effects on the production of food and cash crops in the country. Agriculture in Nigeria is dominated by small-scale farmers who produce about 80% of the total food requirement (Fayinka, 2004). These farmers are characterized by strong dependence on agricultural labour market, little or no forms of savings or storage facilities and cultural practices adopted are highly labour intensive (Festus, 2005; Fakayode, etal 2008).

The production and socio-economic characteristics of the farmers, inconsistent government policies, the poor infrastructural base, all interact and affect the agricultural sector, resulting in low production, high price of food items, inflation, under-development and poverty. If Nigeria is ready to go back to agriculture, the problem of poverty, hunger and malnutrition could be alleviated.

Adequate production of most Nigeria staple crops such as sorghum which is consumed in many parts of the country, will contribute positively to the agricultural sector.

Sorghum (*sorghum bicolor* L moench) is one of the most important staple crops in Nigeria, and is the most important cereal food in the Northern states that covers the guinea savannah ecological zone (FAO, 2005). Sorghum production surpasses all other crops (FMEST, 1984). In terms of food contribution, sorghum is the major cereal consumed by the majority of the population (NAERLS, 1997). In the Northern states, about 73% of the total calories intake and 52.3% of the per capital protein intake are contributed by sorghum alone (Samm, 2009).

Sorghum has a unique property that makes it well suited for food uses. Some sorghum varieties are rich in antioxidants and all sorghum varieties are gluten free, an alternative for wheat allergy sufferers (Annon 2, 2010). Sorghum is one of the most drought tolerant cereal crops currently under cultivation. It offers farmers the ability to reduce costs on irrigation and other on-farm expenses. Sorghum requires an average temperature of at least 25<sup>0</sup>c to produce maximum yield. In general, is a very competitive crop and does well in competing with weeds in narrow rows (FAOSTAT, 2010).

Sorghum is a very high nitrogen feeding crop. 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 (Annon 2, 2010). The leaves and grain of sorghum are use for livestock feeds and stalks for thatching houses and making fences. Sorghum is a very valuable industrial crop for brewing alcoholic and non-alcoholic drinks as well as in the baking and confectionary industry. In Nigeria, according to NRC (1996), sorghum has greater untapped potential than any other crop. It even postulated that if the twentieth century was the century of rice, wheat and maize, then the twenty first century could become the century of sorghum.

### Research Questions

- (i) What are the socio-economic characteristics that affect sorghum production?
- (ii) What is the relationship between input used and output obtained in sorghum production?
- (iii) What are the constraints in sorghum production in the study area?

### Methodology

This study was carried out in Ifelodun Local Government area of Kwara State, Nigeria. Ifelodun is the largest local government area in Kwara State with an estimated population of about 206,042 and an estimated total land area of about 3,435 km<sup>2</sup> (NPC, 2006, KWSMI, 2002). The area is located between latitude 7<sup>0</sup> 45N and 9<sup>0</sup> 30N and longitude 2<sup>0</sup> 30E and 6<sup>0</sup> 35E. It is characterized by dry and wet season. The annual rainfall ranges between 1000mm and 1500mm. Average temperatures between 30<sup>0</sup>c and 35<sup>0</sup>c and humidity range from 35% to 60%. The major source of livelihood and occupation of the people in the area is farming. Farming is traditional in nature with emphasis on the cultivation of crops such as sorghum, cassava, yam, maize and melon (KWSMI, 2002, Mohammed, 2008). Sorghum is majorly grown among farmers in the area; this informed the choice of the local government area.

### Sampling Technique

A reconnaissance survey was first conducted with the assistance of the extension staff of the Agriculture Department of the local government area to identify farmers who grow sorghum on their farm and/intercrop mixture.

A two stage random sampling technique was used in selecting the sample for the study. The first stage involved the random selection of 74 villages and towns from the 8 districts in the local government area using the result from the reconnaissance survey and the Kwara State ADP village listing as sample frame.

The second stage involved a random selection of sorghum farming households in each village. A total of two hundred and twenty six (226) farming households were selected and interviewed for the study.

### Data Collection

The source of data used for this study was basically primary data. This involved the use of an interview schedule with a well designed structured questionnaires administered to the farmers. The secondary information were however, obtained from textbooks, internet, journals, past projects, etc. Data were collected based on the socio-economic variables such as age, farm size, gender, educational status, income, costs and returns and constraint faced by the farmers. The response of those farmers forms the primary data used.

### Analytical Technique

The analytical tools that were used for this include descriptive statistics, gross margin analysis, and production function.

### Descriptive Statistics

The descriptive statistics employed includes frequencies and percentages ratios. This was used to analyze the socio-economic characteristics of the farmer as well as the constraints associated with sorghum production. This tool was used to achieve objective number i and iv.

### Gross margin analysis

Gross margin analysis is by definition the different between the gross farm income and total variable cost (Olukosi and Erhabor, 1988). Normally, gross margin analysis is used to test the effects of changes that do not alter the fixed cost of production, especially the cost of land and other durable factors. It is used to determine the potential profitability and effect on farmer's farm income. It has the advantage of being simple as well as useful in the analysis of the profitability of small farms that have small fixed costs (Samm, 2009).

The gross margin analysis was estimated from costs and returns in sorghum production. The tool was used to achieve objective (ii).

Gross margin model is expressed as follows:

$$GM = TR - TVC$$

Where:

$GM$  = Gross margin (₦/ha)

$TR$  = Total revenue or total value of output from the sorghum enterprise (₦/ha). It is the product of average output per hectare multiplied by the market price. The price used was open market price of the year 2010.

$TVC$  = Total variable cost or the costs that are specific in producing (sorghum) output (₦/ha).  $TVC$  varies according to output and are incurred on variable inputs. This includes cost of inputs like seeds, fertilizer, and harvesting, processing, labour cost (hired/family).

### Efficiency Ratio

Resource use efficiency was obtained from the production function analysis. Efficiency is generally defined as the quantity of output ( $Y$ ) per unit of input ( $X$ ) used in the production process, that is, the average physical productivity (APP).

In order to ascertain whether resources were efficiently utilized, the marginal value product (MVP) of the variable inputs used was computed and compared with their input prices. The following ratio was used to compute the efficiency of resource use.

$$R = \frac{MVP}{MFC}$$

Where:

$R$  = Efficiency ratio

$MVP$  = Marginal value product (value added to sorghum output due to the use of additional unit of input)

$MFC$  = Marginal factor cost (cost of unit of a particular resource).

## Results and Discussion

### Social Economic characteristics

The results of the social economic characteristics are presented in table 1. Farmers between the ages of 46 years old and above were more involved in sorghum production (70%). This agrees with the findings of Mohammed (2008). This implies that farmers in the study area are within the productive stage. Age is an important determinant of social – economic status of a population since people wear in energy as they advance in age. Therefore, this generally aged sorghum farmers could have negative implications on the future of sorghum cultivation in the study area. This is because these older people may not be willing to adopt innovations in agriculture; usually, they argued that their forefathers practiced farming successfully without modern innovations.

**Table 1:** Social Economic Characteristics

Variable	Description	Freq.	Per.	Cum. Per.
Age of Respondent	≤ 25	6	2.65	2.65
	26 - 35	14	6.19	8.85
	36 - 45	49	21.68	30.53
	≥46	157	69.47	100.00
	Total	226	100.00	
Gender	Male	205	90.70	90.70

Variable	Description	Freq.	Per.	Cum. Per.
	Female	21	9.30	100.00
	Total	226	100.00	
Marital Status	Single	9	4.00	4.00
	Married	210	92.90	96.90
	Divorced	1	0.40	97.30
	Widowed	6	2.70	100.00
	Total	226	100.00	
Education Status	No formal education	64	28.30	28.30
	Primary education	44	19.50	47.80
	Quranic education	31	13.70	61.50
	Secondary Education	54	23.90	85.40
	Tertiary education	33	14.60	100.00
	Total	226	100.00	
Source of Fund	Personal	159	70.40	70.40
	Money lender	29	12.80	83.20
	Bank loan	14	6.20	89.40
	Cooperative	24	10.60	100.00
	Total	226	100.00	
Years of Experience	≤ 10	57	25.22	25.22
	11 – 20	73	32.30	57.52
	21 – 30	55	24.34	81.86
	≥ 31	41	18.14	100.00
	Total	226	100.00	

Source: Data Analysis, 2010.

However, it is important to note that the older a farmer becomes, the better his understanding of the social, climatic and economic factors that affect farming and thus more experienced.

Sorghum production seem to be a male dominated activity in the study area as about 90.70% of the sample farmers are male. This may be due to the fact that women majors in processing. The male domination of sorghum farming may in turn be due to high demands of time and efforts required to work in such enterprise. This agrees with the study of Baiyegunhi and Fraser, (2009).

Majority of the respondents are married (93%). This shows that the respondents are responsible according to societal standard. These married respondents may have engaged in sorghum production in order to cater for the needs and wants of their family members. Illiteracy is one of the factors militating against agricultural development in Nigeria. The study shows that 28.30% of the sorghum farmers had no formal education, while about 62% managed to acquire primary and/ quranic education. Usually, such low literacy level is not enough to provide any white collar job. Their educational status as it is however is enough to provide them with the ability to read and write, handle and interpret messages relating to their farm operation in the instruction manuals on input and machinery uses, and also enable them to appreciate extension services. Education is a major determinant of the Nation economy. The level of formal education attained by an individual goes a long way in shaping his personality, attitude to life and adoption of new and improved practice (Sullumbe, 2004).

Personal savings was the major source of credit facility of the farmers (70.40%). A few others sourced credit from cooperatives (10.60%), bank (6.02%) and money lender (12.80%). It could be concluded that respondents in the study area do not enjoy credit facility from financial institutions, which may be as a result of lack of awareness, low literacy level, interest rate and bureaucracy. These of course have hamper production to a large extent. Annon 1, (2009) asserted that loan is a crucial input as it is used to establish and expand farm sizes. Majority of the sorghum farmers (74.78%) have been producing sorghum for upwards of 30 years, while about (25.22%) have at most 10 years of experience. It could therefore be said that majority of the farmers are experienced sorghum growers. Also, since experience is gained with age and farming being the major occupation of most of the respondents, the number of year of experience in farming can be linked with the age of the farmer. The older the farmer, the more experienced he is and the better his understanding of farming.

**Gross Margin**

The various cost incurred on various resources used and the benefit (profit) obtained from the sales of the produce were estimated based on the market price at the period under consideration (2010 farming season) is presented in Table 3. A gross return was calculated by multiplying the total quantity of produce harvested by the price of output sold. The average gross return of the respondents was N63, 409.00. For cost of production, total variable cost and total fixed cost were considered in order to calculate the total cost of production. The total variable cost includes cost of labour, chemicals, fertilizer and seeds while total fixed costs includes cost of renting land, and depreciation on farm tools. The straight line method, which assumed a constant rate of annual depreciation, was used to calculate the depreciation on farm tools.

The labour used consists of family, hired and group labour. The wage rate varies slightly depending on the operation to be performed on the farm. The average wage rate of ₦750.00 per man-hour was used to calculate the total labour cost. The total cost of labour was found to be ₦2, 088,750.00, which is about 8.11% of the variable cost.

The cost incurred on chemical was ₦2, 239,750.00, accounting for about 8.69% of the variable cost. This may be due to high cost of chemicals and the facts that the sampled farmers may have use seed dressing chemicals such as herbicides and insecticides that prevent undue exposure of cultivated seed to fungal attacks and consequently a possible reduce in economic yield as observed by Baiyegunhi and Fraser (2009).

**Table 3:** Gross margin and returns in investment

Item	Amount (N)	
Total Revenue		63,409,400
Labour	2,088,750	
Cost of chemicals	2,239,750	
Cost of fertilizer	17,443,200	
Cost of seed	3,981,600	
Total variable cost	25,753,300	25,753,300
Gross margin		37,656,100
Total fixed cost	7,718,900	7,718,900
Net Farm Income/Profit (NFI)		29,937,200
Rate of Return on investment (ROR)	1.89 (189%)	
Efficiency level/(RORCI)(%)	0.89 (89%)	

Source: Data Analysis, 2010.

An average market price of ₦5, 000.00 per 5 kilogram of sorghum seed was used in estimating the total cost of seeds. The total cost of seed used was found to be ₦3, 981,600.00, which is about 15.46%. The cost of fertilizer was very high. This was calculated to be ₦17, 443,200.00, about 67.74% of the total cost of production. From this results, we could deduced that: the high cost of a bag of fertilizer, poor crop management practices and the use of low yielding crop varieties as majority of the farmers grow local varieties of sorghum has contributed immensely to the high cost of production observed. The table shows that on average the total variable cost is ₦25, 753,300 which accounts for about 76.94% of the overall production cost.

The gross margin and net farm income (profit) were ₦37, 656,100.00 and ₦29, 937,200.00 respectively. The rate of return (ROR) on investment is 189%. This implies that for every ₦1 invested into the sorghum enterprise, ₦1.89 is made as revenue. That is, about 89 kobo is realized as profit. The rate of return on capital invested estimate (RORCI), otherwise called efficiency level is 0.89. This suggest both viability and profitability of sorghum enterprise in the study area as this value is extensively higher than current lending rate of between 6 – 25% charged by both cooperative society and commercial banks in the study area.

**Problems Affecting Sorghum Production**

The primary objective of farmers in production enterprise is profit maximization; this is also true of farmers in the study areas as majority of the farmers sampled had this as basic objective. This is as a result of the fact that sorghum is not only consumed, but also serve as feed and residual, export crop and one of the most drought tolerant cereal crops currently under cultivation Annon 3, (2010). Table 4 explained some problems affecting sorghum production in the study area. These includes but not limited to high cost of labour, transportation fund, lack of access to extension services etc.

About 43.75% the respondents identified high cost of labour as very severe. Although family labour was used, but hired labour was mostly employed. Scarcity is usually characterized by high cost of input variables of production; therefore the high cost of labour could imply unavailability of labour. Hence the amount charged per man-day was high. This explains the reason behind the high cost of labour.

**Table 4:** Problems/Constraints affecting sorghum production

Constraints	Severity (%)				
	VS	S	NS	Indiff.	Total
High cost of labour	43.75	37.50	18.75	0.00	100.00
High cost of transportation	44.64	37.50	16.96	0.89	100.00
Inadequate fund	71.43	22.32	5.80	0.45	100.00
Inadequate access to Extension services	58.85	25.22	13.72	2.21	100.00
inadequate access to improved/hybrid seed	73.89	12.83	13.27	0.00	100.00
Lack of market for product	20.35	17.70	56.64	5.31	100.00
Lack of motorable road	26.79	29.91	40.63	2.68	100.00
Lack of recommended Agrochemicals	40.63	23.21	30.80	5.36	100.00
Poor pricing of sorghum products	24.11	28.57	45.09	2.23	100.00
Problems of pest and diseases	33.04	26.34	37.50	3.13	100.00

Source: Data Analysis, 2010.

Fund was also cited as very severe constraints to sorghum production (71.43%) in the study area. This may account for the reason most respondents are small- scale farmers. Also, the stringent conditions and bureaucratic bottleneck of credit institutions shy farmers away from obtaining loans to finance their farm operations.

Another problem considered as being very severe by the respondents is lack of access to improved hybrid sorghum seed. This is perceived by about 73.89% of the respondents. This may be due to non awareness, poor education and poor access to extension services-which was also considered as very severe problem by about 58.85% respondents.

In Nigeria today, the ratio of extension to famers is about 1: 25,000 (Paul Mari Bdliya, 2009). This is very unacceptable if we are to attain the food security for the populace.

Other problems identified as being very severe in sorghum production are inadequate recommended agrochemicals, while poor pricing of sorghum products and problems of pest and diseases are identified as not severe.

### Conclusion

Sorghum production occupies a very important position in arable crop production in Ifelodun Local Government Area of Kwara State and Northern Nigeria, because of its economic values in this part of the country and perhaps the whole country at large. Cultivation of this very important crop is evenly distributed and can be grown in any region or part of the state. The ease of cultivation, favourable rainfall pattern and its drought resistance attributes allow for its vast growth in the country. What a unique characteristic among other food crops grown in Nigeria!

Sorghum production was found to be viable and profitable under efficient management. Sorghum potentials in terms of yield and quality of the product have not been fully exploited. Consequently, there is still deficit supply of sorghum in the country. This could be adduced to inaccessibility of the farmers to the appropriate modern technology and modern innovations such as improved seeds, fertilizer, lack of fund and inadequate extension services. This poses serious threat in the general food supply in the future, if nothing is done to correct the imbalance in sorghum production.

To fully tap the potential of increasing sorghum production and maximize its output, it is therefore necessary for individuals, government and non- governmental organization to assist the farmers in order to improve sorghum production in the study area and Nigeria in general.

### Recommendation

From the findings, it is established that sorghum potentials has not been fully exploited in the study area. It is also evident that sorghum production is viable and profitable. Therefore, in order to increase production level of sorghum and its profitability, the following recommendations are made;

- i. Efforts should be made at mobilizing farmers into a viable and formidable co-operate groups in order to address inadequate access to credit facilities. This will help mobilize rural savings that can be readily available to the farmers. Farmers, if capacitated financially can easily afford necessary farm inputs such as fertilizer, which was shown to significantly affect sorghum production. Also, all existing credit facilities and schemes put in place to assist farmers should be strengthened so that farmers can have access to soft loan and such loans should be interest free with no stringent condition so that farmers can expand their scale of production.

- ii. Improved seed varieties, improved technologies on sorghum in terms of seed varieties, seed rate, spacing, plant arrangement, date of planting and fertilizer rate should be extended to farmers for adoption.
  - iii. Sorghum farmers should be provided with services of well trained extension workers in the study area, especially in management aspect. Also, the current ratio of one extension officer to about twenty five thousand (1:25000) farmers should be reduced to the standard ratio of 1:1000.
  - iv. Labour is a predominant cost item on farm size, there is therefore need for research to develop low cost technologies that will reduce the level of labour input for various farm operations.
  - v. In solving transportation problem, suitable means of transportation should be provided to enable other market outlets outside the study area to benefit from the farmers in terms of buying and selling.
- Undoubtedly, these measures have their short comings but they are not insurmountable if adequately and sincerely executed.

## References

- Adegboye, R.O. (2004). Land Agriculture and Food Security in Nigeria. Faculty Lecture delivered at the University of Ilorin, Faculty of Agriculture, 25<sup>th</sup> February.
- Akosile, A. (2003). Agriculture; can it really alleviate poverty? This day, 27<sup>th</sup> August, pp 47-48.
- Annon 2, (2010). Sorghum cultivation and uses. (<http://www.grains.org/index>). Retrieved October, 2010.
- Annon 1, (2009). Nigeria Vision 20: 2020. Economic Transformation. Blueprint, National Population Commission, December 2009.
- Annon 3, (2010). Sorghum, <http://www.sorghum.state.ne.us>. Accessed October, 2010.
- Baiyegunhi, L.J.S and Fraser, G.C.H. (2009): Profitability in sorghum Production in three villages of Kaduna State Nigeria. Journal of Applied Sciences Research, 5 (10): 1685-1691 INSI net Publication.
- Central Bank of Nigeria (CBN), (2000). Changing Structure of the Nigerian Economy and Implications for Development CBN Publication, August, 2000.
- Fakayode, B.S. Babatunde, R.O. and Ajao Rasheed, (2008). Productivity Analysis of cassava based production systems in the Guinea Savannah: Case study of Kwara State, Nigeria. American-Eurasian journal of Scientific Research 3(1): 33-39 IDOSI Publication.
- FAO, (1995). Sorghum and millets in human nutrition. Food and Nutrition series, No.27, Rome. Italy (<http://www.fao.org/docrep>).
- FAOSTAT, (2010). Food and Agriculture Organization of the United Nations. ([http://faostat.fao.org/site/567/default.aspx?\\_anchor](http://faostat.fao.org/site/567/default.aspx?_anchor)). Retrieved October, 2010.
- Fayinka, F.A. (2004). Food Security in Nigeria Challenges under Democratic Dispensation. Paper presented at the 9<sup>th</sup> ARMTI Annual Lecture held on March 24, 2004.
- Festus, A. (2005). Unveiling Kwara's White Farmers. Sunday Punch 17<sup>th</sup> July, 2005. p. 35.
- FMEST, (1984). Federal Ministry of Education, Science and Technology. Sorghum: Science and Technology Briefing.
- Gulai, A. (2000). Globalization, WHO and Food Security, emerging issues and options. Quarterly Journal of International Agriculture Vol. 39 (4): 342-356
- Kwara State Ministry of Information, (KWSMI, 2002). Kwara State Diary, 2002 PP 1-10.
- Mohammed, B.T. (2008). Economic Analysis of Melon (*Citrullus Lanatus*) Production in Kwara State. Proceeding of 42<sup>nd</sup> Annual Conference of Agricultural Society of Nigeria (ASN), held on 19<sup>th</sup> - 23<sup>rd</sup> October at Abakaliki pp.57-58.
- NAERLS, (1997). National Agricultural Extension and Rural Liaison services. Prospects and Problems of the 1997 Cropping Season. NAERLS/APMUE. Kaduna Nigeria.
- NPC (2006). National Population Census Result Sheet.
- NRC, 1996). National Research Council (NRC), Lost Crops of Africa. Volume 1 Grains: Washington D.C. National Academy of Science.
- Nyanko, M.H. (2006). Agriculture as a Major Foreign Exchange Earner: Issues and Implications, National Pilot Paper 3(26): 19.
- Ohajianya, D.O. (2004). Gender and household food security in Imo State, Nigeria. Nigerian Journal of Technology and Education in Nigeria 9(1): 11-18.
- Olukosi, J.O. and Erhabor, P.O. 1988): Introduction to Farm Management Economics: Principles and Applications. AGITAB Publishers Ltd Zaria, Nigeria.
- Paul Mari Bdiya (2009): Increased Agricultural Productivity; Road Map to Achieving Food Security in Nigeria. Paper presented at the National Workshop on "Promoting Appropriate Mechanization Technology for Improved Agricultural Productivity in Nigeria" held at NCAM, Ilorin, November, 24-25<sup>th</sup>, 2011. Pg 1-17.
- PCU/FMARD, (2004): Project Coordinating Unit and Federal Ministry of Agriculture

Crop Production Data in Nigeria.

- Samm, B.M. (2009): Gross Margin Analysis and Linear Programming; Tools in understanding how farmers in the guinea savannah region of Nigeria rejected the most profitable type of sorghum recommended by scientists. Proceedings; Pre-Conference of the Western Agricultural Economics Association 2009 Meeting, June 24, pp. 1-20
- Sullumbe, I. M. (2004): Resources use efficiency in cotton production under sole cropping system in Adamawa State of Nigeria. A Dissertation submitted to the school of Post graduate studies Maiduguri, Nigeria.
- Ya'aishe Modu, Putai, J.A. and Petu-Ibikunle, A.M. (2010): An Economics analysis of cowpea production among women farmers in Askira/UBA LGA of Borno State, Nigeria. African Journal of General Agriculture Vol. 6 No.1. March, 31 7:17.