Profitability of Sugarcane Production and Its Contribution to Farm Income of Farmers in Kaduna State, Nigeria

M. Sulaiman[1*], Z. Abdulsalam[2] and M. A. Damisa[2]

[1]*Department of Economics, Federal College of Education, Zaria, Kaduna State, Nigeria.*
[2]*Department of Agricultural Economics and Rural Sociology, Faculty of Agriculture, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.*

Authors' contributions

This work was carried out in collaboration between all authors. Author MS designed the study and wrote the first draft of the manuscript. Author ZA reviewed the design, draft of the manuscript and managed the analyses of the study. Author MAD performed the statistical analysis, discussed the results and handled the recommendations. All authors read and approved the final manuscript.

Mini-review Article

ABSTRACT

Aims: Aims of the study were to determine how profitable is sugarcane production and its contribution to farm income of farmers in Kaduna state.
Study Design: Primary data were collected for this study from sugarcane farmers through the use of well structured questionnaires.
Place and Duration of Study: This study was carried out in Maigana Agricultural Zone of Kaduna state, Nigeria between September and December 2014 cropping season.
Methodology: Multistage-stage sampling technique was employed for data collection.
Results: A total of 330 respondents were randomly selected and interviewed. The net farm income of sugarcane farmers in the study area per hectare was realized to be ₦78,036.05 k. The results also revealed that the average return on investment was ₦1.83 k; meaning that for every ₦1

Corresponding author: E-mail: smuhammad1981@gmail.com;

invested in sugarcane production in the study area, a profit of ₦1.83 k was realized by the farmers. Also, sugarcane production in the study area contributed averagely to about 19.55% of the farmers' annual farm income.

Conclusion: It is concluded that sugarcane production in the study area was profitable despite the problems encountered; that none of the farmers solely depended on sugarcane farming as his only source of income; rather majority of them (i.e. about 80%) earned most of their income from other sources annually.

1. INTRODUCTION

Sugarcane (*Saccharum officinarum*) is one of the most important crops in the world because of its strategic position and immense uses in the daily life of any nation as well as for industrial uses aimed at nutritional and economic sustenance. Sugarcane contributes about 60% of the total world sugar requirement while the remaining 40% came from sugar beet [1]. It is a tropical crop that usually takes between 8 and 12 months to reach its maturity. Matured cane may be green, yellow, purplish or reddish considered ripe when sugar content is at its maximum [2].

In Nigeria, sugarcane is one of the industrial crops that, before 1982, contributed to elevating the nation's GDP in the agricultural sector. However, little attention was paid to its production after 1982 and this accounted for the collapse of some sugar factories and the consequent increase in unemployment in the country [3]. Nigeria has vast human and natural resources, in terms of land and water, to produce enough sugarcane, not only to satisfy the country's requirement for sugar and bio-fuel, but also for export [4].

World production of sugarcane stood at 1.5 billion tonnes as of 2008 [5]. Brazil, China, Cuba, Mexico, Pakistan, Thailand, USA, Colombia, Australia and Indonesia are the leading countries in sugarcane production. Brazil, India and Cuba are the leading countries in sugarcane production, producing over half of the total world sugarcane production. Africa in the same reporting period has 1.2 million hectares with 72.1 million metric tons, respectively [2]. The important sugar-producing countries in the tropical Africa are Mauritius, Kenya, Sudan, Zimbabwe, Madagascar, Cote dIvoire, Ethiopia, Malawi, Zambia, Tanzania, Nigeria, Cameroon and Zaire. Nigeria is one of the most important producers of the crop with a land potential of over 500,000 hectares of suitable cane field capable of producing over 3.0 million metric tons of sugarcane. If processed, it will yield about 3.0 million metric tons of sugar [4].

Nigeria is the largest consumer of sugar in West Africa and has a large area of cultivable land suitable for the growing of industrial sugarcane [6,7]. Nigeria is noted to be abundantly blessed with human, water and environmental potentials for the production of sugarcane. Areas with high potentials for commercial sugarcane /sugar production have been identified through studies sponsored by the Federal Ministry of Industry and conducted by Dutch consultants HVA in the early eighties. It should be pointed out that most of the areas in the Northern States where water for irrigation is available; sugarcane cultivation in large quantities is feasible. The crop can be rotated or even inter-planted with other crops where land with adequate sources of water abounds like in the various River Basin Development Authority Areas [8].

According to [9], sugarcane is produced and sold in many local government areas of the state, including Makarfi, Giwa and Kudan. About 20 thousand households in the state grew sugarcane in 2013.

1.1 Profitability Measurement Using Net Farm Income

Net farm income is the difference between gross income (revenue) and total cost of production. It is used to show the levels of costs, return and net profit that accrue to farmers involved in production [10]. The technique emphasizes the costs (fixed and variable cost) and returns of any production enterprise. [11] have examined two major categories of costs involved in crop production. These are fixed and variable cost. Fixed cost (FC) refers to those costs that do not vary with the level of production or output while variable costs (VC) refer to those costs that vary with output. The total cost (TC) is the sum of total fixed cost (TFC) and total variable cost (TVC).

[12] examined resource-use efficiency and profitability of fluted pumpkin and found that the net farm income to be ₦116,891.39 per hectare.

[13] assessed the profitability of Egusi Melon under sole and intercropping system in Okeni Local Government area of Kogi State of Nigeria and found out that the average net farm income per hectare for sole melon and two, three and four crop mixtures were ₦1,328.68, ₦915.77, ₦887.27 and ₦414.57 respectively; the total gross return per hectare for melon (pooled data) averaged ₦12,638.61 while the total cost of production was ₦8,838.74 on average and the total net farm income per hectare for both sole and mixed (pooled data) melon was ₦3,799.00 on the average, implying that Egusi melon production was profitability in the study area.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Kaduna state. The State is located in the north central to middle belt of Nigeria. The state lies between latitudes 9°10' East and 11°30' North and longitudes 6° East and 9°10' North, respectively. It shares borders with Kastina and Kano states to the north, Plateau state to the north-east, Nasarawa state to the south and Niger and Zanfara states to the west. To the south-west, the state shares border with the Federal Capital Territory (FCT). The state has a total land area of about 4.5 million hectares, with an estimated total arable land of about 2.02 million hectares comprising 1.94 million hectares upland and 0.8 million hectares lowland. It has an estimated population of approximately 6,113,503 people with an annual growth rate of 3.2% making it the third most populous state in Nigeria [14].

There are two distinct seasons in the state namely: wet and dry. Wet season generally spans April – October, while dry season falls between October and March. The average rainfall is about 1,482 mm, while temperature ranges from 35°c to 36°c during the humid period to as low as 10°c – 23°c during the winter periods of November – February. The state falls within the Southern and Northern Savannah Ecological Zones characterized by woodlands with grasses of different species. The soil is developed from undifferentiated complex igneous and metamorphic rocks. The fine top soil coupled with reasonable organic matter in it, enhances the fertility status of especially the Southern part of the state. The physical properties of the soil are moderately good and allow for continuous cropping for a wide variety of crops [9].

About 80 percent of the State's population is engaged in peasant farming producing both food and cash crops. The crops produced in the state include cotton, groundnut, tobacco, maize, beans, guinea corn, millet, rice, ginger, cassava, sugarcane, yam and potatoes. During the dry season, a considerable number of people in the state are engaged in irrigation farming along some major rivers and dams. Low lying fertile land with a lot of alluvial deposit known as the "Fadama" is particularly important for irrigation farming in Kaduna State. The total "Fadama" area in Kaduna state is estimated to be 80,000 ha out of this only 11,000 ha have been put under cultivation. The crops cultivated are mainly vegetables and among the cash crops, there is sugarcane [9].

The state produces over 40,000 MT of sugarcane every year. Makarfi LGA accounts for about 39% (15,500MT), Giwa LGA produces 15% (6,200MT) while Kudan LGA 13% (5,200MT) of the total annual state production. Another important aspect of agriculture engaged by the people is the rearing of cattle, sheep, goatsl, pigs and poultry farming. Kaduna State occupies a very strategic position in terms of its historical role, contemporary political development and economic activities. Kaduna state has 23 local government councils [9].

2.2 Sampling Procedure and Sampling Size

For this study, a multi-stage sampling technique was employed. In the first stage, Makarfi, Giwa and Kudan local government areas were purposively selected out of 23 LGAs that make up the state. This was because, they were the most prevalent sugarcane producing areas in the state [9]. In the second stage, nine villages were purposively selected out of villages that were prominent in sugarcane production (three from each of the selected LGA). In the third stage, only 25% of the total number of sugarcane farmers in each of the nine villages was randomly selected for this study. This represented a sample size of 330 respondents.

2.3 Data Collection

The data for this study was collected from primary source only. The data was obtained using the interview method with well structured

questionnaires administered among the respondents. The information collected from the respondents of sugarcane producers included: age, sex, number of years in farming, educational qualification, household size, number of extension contacts, farm size, inputs availability and prices, farming technique, output etc.

2.4 Model Specification

[15] described budgeting as the detailed quantitative statement of a farm plan and a forecast of its financial result. Olukosi and Erhabor [11] defined a farm budget as a detailed physical and financial plan for the operation of the farm for a certain period of time. Farm budgeting was used in this study to determine the levels of costs, returns and net revenue that accrue to sugarcane production based on the inputs used. The budgeting tool that was used in the study is the Net Farm Income (NFI). It is measured as the difference between the Total Gross Margin (TGM) and the Total Fixed Cost (TFC). The Gross Margin by definition is the difference between the Gross Farm Income (GFI) and the Total Variable Cost (TVC); while the Gross Farm Income (GFI) also known as Total Value of Production (TVP), is the Total Physical Product (TPP) multiplied by unit market price of the product [11].

The Model is expressed as follows:

$$NFI = GM - TFC \qquad (2a)$$
$$GM = GFI - TVC$$
$$GFI = TVP = TPP.P_x$$

Where:

NFI = Net Farm Income (Naira/ha)
GM = Gross Margin (Naira/ha)
TFC = Total Fixed Cost (Naira/ha)
GFI = Gross Farm Income (Naira/ha)
TVC = Total Variable Cost (Naira/ha)
TVP = Total Value of Production (Naira/ha)
TPP = Total Physical Product (Kg/ha) and
P_x = Unit market price of the product (Naira/ha)

3. RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of Sugarcane Farmers

Table 1 represents the socioeconomic characteristics of sugarcane farmers in the study area. It shows 30% of the farmers fell within the age bracket of 41 – 50 years while about 12% fell above 60 years. The mean age was found to be approximately 45 years. This reveals that sugarcane production in the study area was dominated by young farmers who were active and within productive age group. Hence, they can contribute positively to producing agricultural products for more than a decade in a near future. Majority of the farmers (54%) had household size of between 6 and 10 persons. A sugarcane farmer in the study area had an average household size of 7 persons. This implies that farmers have more free hands in the farm which they used as their farm main source of labour supply. Hence, the farmers' cost of sugarcane production in terms of hiring labour has been minimized. Majority of the sugarcane farmers (69%) were found to have more than 10 years sugarcane farming experience with a mean of 20 years. This means that farmers with more sugarcane farming experience are expected to be more technically efficient in sugarcane production than those with less in the study area. This is because they could know better the suitable land area where the crop can be planted, how to plant it, time of planting, weed control, fertilizer application and other resource inputs efficient utilization than those who had just recently started. About 50% of these farmers had no formal education while the remaining had at least primary educational level. This implies that half of these farmers could be in a danger of missing or not understanding most of the written information and up to date knowledge about sugarcanes farming unless someone that can read is called upon which may cause delay in the production process. Also, about 71% of the farmers had extension contact with an average number of two times. This implies that majority of the farmers have been assisted by extension agents on sugarcane farming in the study area.

3.2 Irrigation in Sugarcane Farming

As already stated, usually sugarcane takes between 8 and 12 months to reach its maturity and the study area has two distinct seasons namely: wet season which generally spans April – October while dry season falls between October and March. Hence, majority of the sugarcane farmers were found to have irrigated the crop for more than two months as presented in Table 2; the irrigation took place at least twice in a week (i.e. for every three days interval). This implies that sugarcane production is a time consuming farming that demands extra efforts

and fund from its farmer. However, it is profitable crop farming.

3.3 Sugarcane Mode of Sales

The sugarcane farmers in the study area were found sold their output after harvesting either right in the farm or taken to the market place for sale. Some of the farmers sold the entire sugarcane produce in the farms to a wholesaler or dealer at one point in time, some sold gradually ridges day-after-day to wholesalers and retailers while others, especially farmers planted on smaller farm size took it to the nearest market place for sale. Most of the farmers stressed that selling the sugarcane crop in the farm is preferred and better than taken it to the market

place. This was because it minimizes costs and the risk of not having a buyer in the market. Whereas in the farm only the needed quantity will be harvested while the remaining left standing. Therefore, 292 farmers (88.45%) were found sold their harvest (output) right in the farm while the remaining 38 (11.52%) took it to market place for sale as presented in Table 3.

3.4 Profitability Analysis in Sugarcane Production

This is simply the difference between the total revenue and total costs of production. Thus, on average basis, the estimated total revenue in the study area was ₦171,510.95 k per hectare.

Table 1. Socio-economic characteristics of sugarcane farmers

Characteristic		Frequency (N = 330)	Percentage (%)
Age (Years)			
20 – 30		59	17.88
31 – 40		78	23.64
41 – 50		99	30.00
51 – 60		54	16.36
> 60		40	12.12
Mean	44.82		
Standard deviation	12.98		
Household size			
1 – 5		117	35.45
6 – 10		178	53.94
> 10		35	10.61
Mean	6.76		
Standard deviation	3.3		
Farming experience			
1 – 10		102	30.91
11 – 20		114	34.55
> 20		114	34.55
Mean	19.87		
Standard deviation	12.38		
Educational level			
No formal education		166	50.30
Primary education		38	11.52
Secondary education		111	33.64
Tertiary education		15	4.55
Mean	1.92		
Standard deviation	1.01		
Extension contact			
No contact		95	28.79
1 – 2		87	26.36
3 – 4		128	38.79
> 4		20	6.06
Mean	2.01		
Standard deviation	1.65		

This was obtained by multiplying the average sugarcane output by the unit price. The average sugarcane output cultivated by a farmer (20,589.55 kg) was determined as total quantity of sugarcane output (6,794,550 kg) divided by total number of farmers (330) in the study area; while average sugarcane output cultivated per hectare (42,078.48 kg) was determined as total quantity of sugarcane output (6,794,550 kg) divided by total number of cultivated farm size (161.47 ha) in the study area. The unit price was the price at which a kilogram of sugarcane output was sold. This was estimated as follows: on average basis a tie (*dami*) of sugarcane was sold at ₦250 and it contains 15 stalks; a stalk of sugarcane then cost ₦16.67 k (i.e. 250/15); a stalk weighs 2 kg averagely, thus a kilogram of sugarcane was sold at ₦8.33 (i.e. 16.67/2). Total variable cost per hectare was ₦65,254.90k; this was the sum of cutting, fertilizer, labour and agrochemical costs. Averagely the cost of 100 kg bag of cutting (*sett*) was ₦1000 (i.e. 1 kg = 1000/100 = ₦10), fertilizer was ₦5000 per 50 kg bag (i.e.1kg = 5000/50 = ₦100), labour was ₦700 per man-day (i.e. ₦500 payment for the 5 hours farm work carried out in the morning and ₦200 for 2 hours of the evening time) and agrochemical was ₦1000 per litre. The average quantity of sugarcane cutting, fertilizer, labour and agrochemical used per hectare in the study area were 3014.09 kg, 161.04 kg, 25 man-day and 1.51 liter respectively. Hence, these variable inputs costs were estimated to be ₦30,140.90 (10 x 3014.09) for cutting, ₦16,104 (100 x 161.04) for fertilizer, ₦17,500 (700 x 25) and ₦1,510 (1000 x 1.51), respectively. The total fixed cost was ₦28,220 per hectare; it comprises the land renting and depreciation cost of the farming tools. Averagely, a hectare of land for sugarcane production was rented at ₦25,720; a hoe costs ₦500 and spends 5 years averagely functional, thus its annual depreciation value is ₦100. About 25 number of hoes were used per hectare in the sugarcane production. Hence, the total depreciation cost of the farming tools was estimated to be ₦2500 (100 x 25). By subtracting total variable cost and total fixed cost (i.e. total costs) from the total revenue respectively, the net farm income of sugarcane farmers in the study area per hectare was realized to be ₦78,036.05 k as presented in Table 4.

The results also reveals that the average return on investment was ₦1.83 k. Meaning that for every ₦1 invested in sugarcane production in the study area, a profit of ₦1.83 k was realized by the farmers. Hence, it is vivid to say sugarcane production in the study area was profitable.

Table 2. Number of months took to irrigating sugarcane crop

Irrigation	Frequency	Percentage
No irrigation	0	0.00
1 - 2 months	5	1.52
3 - 4 months	287	86.97
> 4 months	38	11.51
Total	330	100

Source: field survey data (2014)

Table 3. Sugarcane mode of sales

Sales pattern	Frequency	Percentage (%)
Sold Right in the Farm	292	88.48
Sold at the Market Place	38	11.52
Total	330	100

3.5 Constraints Associated with Sugarcane Production in the Study Area

Like other crops farming, sugarcane in the study area was found to be associated with numerous constraints. The major constraints were identified and ranked in order of priority as presented in Table 3 and they were: low demand for the crop was ranked the first constraint, having the highest percentage, inadequate capital and credit inaccessibility, fertilizer at unaffordable price, and theft were ranked second, third and fourth, respectively. Low demand for the sugarcane crop was identified as the major constraint in sugarcane production in the study area. This was mainly because of the recent insurgency, especially in the northern part of the country where the crop was usually produced in larger quantity. Most of the sugarcane farmers complained that the dealers and or wholesalers who normally come from different parts of the country and even abroad like Niger (country) in order to buy the crop in bulk, this season failed to. This was due to the insecurity nature of the region. Thus, led to excess supply of the crop over its demand in the community's and neighbouring towns markets and thereby caused low price for the sugarcane crop. A sugarcane tie (*dami*) sold at ₦500 or ₦700 before was this season sold between ₦200 and ₦300 due to low demand for the crop. Therefore, 157 farmers

(47.58%) out of the 330 chose low demand for the crop as their problem associated with sugarcane production in the study area as presented in Table 5.

Inadequate capital and credit inaccessibility was ranked the second major constraint associated with sugarcane production in the study area. The farmers complained that they have no sufficient fund to cater for the whole expenses incurred in the course of sugarcane production; larger portion of what they spent in the production came from their personal savings while the remaining were borrowings from family members, relatives, friends and local lenders which in most cases they gave less than what have been demanded. As a result the farm activity that supposes to be carried out and finished within few days, such as weeding, buying and application of fertilizer would be delayed for weeks. This delay led to inefficient utilization of resource inputs in the sugarcane production and affected negatively its quality and quantity produced. Therefore, 80 farmers (24.24%) out of the 330 chose

inadequate capital and credit inaccessibility as their problem associated with sugarcane production in the study area as presented in Table 5.

Fertilizer at unaffordable price was ranked the third major constraint to the sugarcane farmers. It was stated annoyingly by sugarcane farmers that the prices of fertilizers were high. A 50kg bag of NPK fertilizer was sold at ₦5,500 while that of urea was ₦4,500. Hence, a piece of land that required say five bags of fertilizer for sugarcane production ended up applied in only two or three bags due to high price nature of the fertilizer coupled with inadequate capital. This insufficient application of fertilizer to the sugarcane crop in the farms crippled its growth and as a result, shortened the desired (frontier) quantity of sugarcane to be produced. Thus, 67 farmers (20.30%) out of the 330 chose fertilizer at unaffordable price as their problem associated with sugarcane production in the study as presented in Table 5.

Table 4. Costs and return per hectare for sugarcane production

A. Return:	Value (₦)	Max value (₦)	Min value (₦)
i- Output (kg/ha)	20,589.55	165,000.00	900.00
ii- Price (₦/kg)	8.33	10.00	6.65
Total Revenue (TR) = (i*ii)	**171,510.95**	**1,650,000.00**	**5,985.00**
B. Cost:			
1. Variables Costs			
a- Cutting (kg)	30,140.90	250,000.00	2,000.00
b- Fertilizer (kg)	16,104.00	130,000.00	1,200.00
c- Labour (Man-day)	17,500.00	140,000.00	2,100.00
d- Agrochemicals (Litre)	1510	6,000.00	1,000.00
Total Variable Cost (TVC) = (a + b + c + d)	**65,254.90**	**526,000.00**	**6,300.00**
2. Fixed Costs			
e- Land Renting	25,720.00	150,000.00	2,000.00
f- Depreciation	2,500.00	20,000.00	300.00
Total Fixed Cost (TFC) = (e + f)	**28,220.00**	**170,000.00**	**5,000.00**
Total Costs (TC) = (TVC + TFC)	**93,474.90**	**696,000.00**	**11,300.00**
Gross Margin (GM) = (TR - TVC)	**106,256.05**	**1,124,000.00**	**-315.00**
Net Farm Income (NFI) = (TR - TC)	**78,036.05**	**954,000.00**	**-5,315.00**
Net Farm Income on ₦1 Invested = (TR/TC)	**1.83**	**2.37**	**0.53**

Source: computed from field survey data (2014)

Table 5. Constraints associated with sugarcane production

Problems	Frequency	Percentage	Rank
a) Low Demand for the Crop	157	47.58	1
b) Inadequate Capital & Credit Inaccessibility	80	24.24	2
c) Fertilizer at Unaffordable Price	67	20.30	3
d) Theft	26	7.88	4
Total	330	100	

Theft was ranked the fourth and the last major problem associated with sugarcane production in the study area. On several occasions according to some farmers many people were caught with theft sugarcane crop loaded on wheel barrows, donkeys, pick-ups and some on foot. This happened mostly at night and especially during the midst harvesting period when most of the sugarcane farmers started harvesting. In course of the thieving many stalks of the sugarcane, especially the immature ones were crushed and damaged, thus most be removed and sold at unwanted price, consumed or given unwillingly as a gift. This reduced the rate of profit earned by these sugarcane farmers suffered from the problem of theft and or augmented their losses. Accordingly, there were 26 farmers out of the 330 who chose theft as their problem associated with sugarcane production in the study area as presented in Table 5.

3.6 Contribution of Sugarcane Farming to the Farmers' Annual Income

The farmers in the study area were found to have had other sources of farm income other than sugarcane farming, such as other crop(s) farming, animal rearing, poultry, etc. The average annual farm income of the sugarcane farmers was estimated to be ₦299,556.36k (98,853,600/330); the average income (profit) earned from sugarcane production by the farmers was estimated to be ₦58,556.36k (19,323,600/330). Hence, sugarcane production in the study area contributed averagely to about 19.55% (58,556.36/299,556.36 x 100) of the farmers' annual farm income. The maximum contribution made was 81.87% while minimum was 0.12%. These imply that none of the farmers solely depended on sugarcane farming as his only source of income; rather majority of them (i.e. about 80%) earned most of their income from other sources annually, as judged by the mean contribution. This was because sugarcane production takes longer period of between 10 and 12 months from planting to harvesting unlike other crops such as tomato, chili paper, cabbage, carrot, maize etc that take shorter period of between 3 and 6 months from planting to harvesting. Thus, they generate income annually more often than the sugarcane. About 13% (i.e.42) of the farmers incurred loss due to low demand for the crop in this production season while the remaining 87% realized profits at different levels.

It can be deduced from this finding that sugarcane production served as one of the sources of farm income of the farmers. In other words, the income of the sugarcane farmers has increased, thereby reducing poverty level among its producers.

4. CONCLUSION

It was found that sugarcane production in the study area was profitable despite the constraints associated with its production; none of the farmers solely depended on sugarcane farming as his only source of income, rather majority of them (i.e. about 80%) earned most of their income from other sources annually.

5. RECOMMENDATIONS

Low demand for the crop has been the major problem for sugarcane farming in the study area. Thus, an enabling environment should be created for sugar industries in the country by the stakeholders to boost production and demand for the crop; there is need for supplying improved variety of the sugarcane *sett*; sugarcane farmers should be trained on farm inputs optimum utilization by the extension agents; farmers should form a formal and strong sugarcane farmers association that would represent their interest in the study area; low interest rate on loan should be charged and unnecessary stringent conditions removed.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Onwueme IC, Sinha TD. CTA field crop production in tropical Africa. CTA, Wageningen, Netherlands. 1991;401-411.
2. Onwueme IC. Crop science: Tropical agricultural series. Cessel, London. 1978; 89-90.
3. Central Bank of Nigeria. Annual Report and Statement of Account; 1999.

4. National Sugar Development Council Policy Report; 2003. Available:www.ngnatsugarpolicy.org

5. Imolehin ED, Wada AC. Advances in sugarcane and sugar research in Nigeria. In: Wada AC, Fatoba IO. (Edt.). Training Manual on Sugarcane Production and Processing. Badeggi NCRI, Niger, Nigeria; 2008.

6. Busari LD, Misari SM. Sugar and Sugarcane in Nigeria. Publication of NCRI, in Nigeria; 1997.

7. African Development Bank (ADB) and African Development Fund (ADF) Operations Evaluation Documents; 2000.

8. Girei AA, Giroh DY. Analysis of the factors affecting sugarcane (*Saccharum officinarum*) production under the out-growers scheme in Numan Local Government Area Adamawa State. Journal of Education and Practice. 2012;3(8):195–200.

9. Kaduna Agricultural Development Project Agricultural Production Survey; 2013.

10. Olukosi JO, Erhabor PO. Introduction to farm management economics: Principles and applications. Agitab Publishers Ltd, Samaru, Zaria, Nigeria; 2005.

11. Olukosi JO, Erhabor PO. Agricultural production economics: Principles and applications. Agitab Publishers Ltd, Samaru, Zaria, Nigeria; 1988.

12. Ayinde AI, Akerele D, Ojeniyi OT. Resource use efficiency and profitability of fluted pumpkin production under tropical conditions. International Journal of Vegetable Science. 2011;17(1):75-82.

13. Yusuf O, Sanni, SA, Ojuekaiye EO, Ugbabe OO. Profitability of Egusi Melon (citrulluslanatusthumb.mansf) production under sole and mixed cropping systems in Kogi State of Nigeria. ARPN Journal of Agriculture and Biological Science. 2008; 2:14-18.

14. NPC. National population commission. Population census of the Federal Republic of Nigeria. Census Report. National Population Commission, Abuja; 2006.

15. Barnard CS, Nix JC. Farm planning and control. Cambridge University Press, UK; 1976.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/9938