Value Chain Analysis of Sesame in Bade and Jakusko Local Government Areas of Yobe State, Nigeria

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ABSTRACT

The study examines value chain of sesame production and marketing in Yobe State, Nigeria. It specifically examined the socio-economic characteristics of the sesame farmers; describe the sources of inputs, characteristics and roles of value chain actors in sesame production and marketing. Data for the study were obtained from a total of 210 respondents using structured questionnaire and interview. Using descriptive statistics, net margin and value added models; the results indicate that each actor along the value chain incurred both variable and fixed costs. The results further showed that labour alone accounted for bulk of the total variable cost for all the actors. And the gross margin per hectare was N82,367.85 with the return on every naira invested amounting to N3.1. The State Agricultural Development Programme should ensure the provision of improved varieties of sesame especially those with high export value and high oil content to the sesame farmers; this agency should also make available cottage level processing and utilization technologies to sesame producers, marketers and processors to enhance value addition as the commodity moves along the chain. This can bring an increase in overall return of all actors along the chain.

Keywords: Value chain, sesame production, marketing, farmers

INTRODUCTION

Nigeria is essentially an agrarian economy, two-thirds of the population of over 160 million people is involved in agriculture and agricultural related industries which maintain a steady contribution of 35 to 40% to total Gross Domestic Product (GDP) between 2008 and 2012 (Oladimeji, Damisa, Abdulsalam and Omokore, 2014a). Until 1970, agricultural exports were the main source of foreign exchange earnings and provides employment opportunities, increase rural income and improve the welfare of the people (Amaza and Olayemi, 2002; Jhingan, 2002). The current trend in agricultural sector's contribution to the development of Nigeria's economy is not consistent with the expected role of agriculture, this is as a result of inconsistent and unfocused government policies, poor infrastructural base among other factors interacted in synergism to asphyxiate the

sector resulting in low production (Okuneye, 2001). Further, the decline in productivity of the agricultural sector was as a result of serious neglect of the sector following the rise in the price of crude oil over the years (Olukosi and Ogunbile, 1989). USAID in collaboration with the Project Coordinating Unit (PCU) of the Federal Ministry of Agriculture and the Nigeria Export Promotion Council (NEPC) at a summit held in Abuja, Nigeria in January 2002 identifies and recommendes certain commodities that have the greatest potential for creating increased economic growth, external and internal trade, opportunities for employment and increased income and wealth for Nigerians. The commodities are: Ginger, Gum Arabic, *Sesame*, Cashew and Leather/skin. Sesame (*sesanumindicum*) has a long history of cultivation mostly for its yield of oil. The plant is usually 60 to 120cm tall and the fruit is a dehiscent capsule held close to the stem. When ripe, the capsule shatters to release a number of small seeds. 1000 seeds weigh about 4-8g (Export Product Profile, 2011).

According to Ashri (1989), sesame is adaptable to many soil types but it thrives best on well drained sandy soil of medium texture. It is drought tolerant due in part to an extensive root system. It requires minimum rainfall of 43 - 44mm and day time temperature of 35-37°C for optimum growth (Weiss, 1983). Global value chain concept as pointed out by Global Value Chain Initiative (GVCI), (2007) is an arrangement that describes the linkages of participants and their value creating activities that enhance the movement of goods and services from production, processing to the end user (consumer). The number and the conduct of participants along the chain determine its efficiency, pricing and returns accruing to each participant at every stage (GVCI, 2007).

In addition, Hartwich, Mongo, Ampuero and Soto (2010) define value chains as mechanism that allows producers, processors, buyers and sellers separated by space and time to add value to products and services as they pass from one segment of the chain to the next until the products gets to the final consumers. Therefore value chain analysis helps to show what different players (actors) in the chain put in and get out (Daniel, 2007). Nigeria in her quest to be among the world 20 largest economy by the year 2020 has to fight poverty among its citizenry and empower them economically to collectively improve the economy of the nation. Indeed, it is believed that over 70% of Nigerians is poverty stricken, living on less than US $1 per day hence living below the United Nations poverty line (UNDP, 2005). This poverty use to manifest in greater proportion in small scale farmers in the form of low income and living standard, poor nutrition, poor housing and health (Oladimeji, Damisa, Abdulsalam and Omokore, 2014a). This level of poverty is prevalent in a country where about 90% of the working adult population is engaged in agricultural activities as means of livelihood (Makama, Murtala and Abdu, 2011).

On the global scale, Nigeria ranks second to Sudan in production and export of sesame with a world market share of 4% equivalent to ₦12.8billion and exporting about 1,700 metric tonnes to Europe and 22,000 metric tonnes to Japan (NEPC, 2010). According to NEAZDP (2005), 85% of farmers in the study area are involved

in sesame production and its processing and marketing a major economic activity in the area which indicates the potentials of the crop in uplifting the living standard of all the actors involve in its production, marketing and processing, but its production in the study area is on the decline as evident by the crop yield area survey (CAYS) on table 1 conducted by Yobe State Agricultural Development Program (YOSADP). While the production of sesame is on the decline in the study area, the demand for the commodity is growing strongly in all the major consuming countries over the past decade as at least 20 countries are importing more than 7000 tonnes per year having risen to 427,000 tonnes per year in 2000 (FAO, 2006).

Table 1: Crop Area Yield Survey (CAYS) of sesame in the study area

Year	Area (Ha)	Yield (metric tonnes)
2004	1930	920
2005	2895	966
2006	2101	942
2007	1976	809
2008	1892	760
2009	1246	634

Source: Yobe State Agricultural Development Program, 2011

Furthermore, the prices of sesame have also been on the rise, from N41,500 per tonne in 2000 (CHEMONICS, 2002) to ₦164,500 per tonne in 2012 (Alibaba, 2013). Despite these favourable trends in the global production and marketing of sesame, the production, processing and marketing activities of sesame in the study area is on the decline. It is against this back ground that this study examines the value chain of sesame in Bade and Jakusko Local Government Areas of Yobe State to provide achievable ends to the following objectives:

(i)   Describe the socio-economic characteristics of sesame farmers,
(ii)   Describe the sources of inputs, characteristics and roles of value chain actors in sesame production and marketing,
(iii)   Determine the average cost and returns (profitability) of sesame production per hectare in the study area.

METHOD

The study was carried out in Bade and Jakusko Local Government Areas of Yobe State, Nigeria, with their headquarters at Gashua and Jakusko respectively. The 2 Local Government Areas are located in the Sahel savannah with semi-arid conditions. Bade covers a land area of 772km^2 and with a population of 139,782 and Jakuskoa total land area of 3,941km^2 and a population of 229,083 (NPC, 2006). The population in Bade and Jakusko are projected in 2013 to be 174,261 and 294,729 respectively representing 3.2% annual growth rate in population (NPC, 2006). The climatic condition is characterized by two distinct seasons; dry and wet seasons. The atmospheric temperature ranges between 39°C and 42°C with average annual rainfall of 500mm-1000mm (NEAZDP, 2011). Agriculture is the major occupation of the local population who are engaged in crop production during both rainy and dry season. This study

adopts survey research method. Multistage sampling procedure was used in sampling the respondents. The first stage involved purposive selection of the two local government areas in Yobe State. The purposive selection was due to their participation in sesame production. The second stage was the selection of major sesame producing villages in each local government area: five from Bade and six villages from Jakusko. In the third stage, 10% of the sample frame was randomly selected from each village. In all, a total of 102 sesame farmers were used for this study. Twenty per cent each of other actors (108 respondents) in the sesame value chain were also randomly selected through Gashua, Girgir and Jakusko registered Grains Marketers and processors Associations (table 2). The randomly selected villages include: Gwiokura, Gwiodina, Dawayo, Aiso, Bizi (Bade) and Gasamu, Girgir, Dachia, Buduwa, Jakusko, Amshi (Jakusko LGA).

Table 2: Summary of the total sample size selection in the study area

	Respondents	**Sample size**
(i)	Farmers*	102
(ii)	Assemblers**	22
(iii)	Wholesalers**	20
(iv)	Retailers**	10
(v)	Processors***	26
(vi)	Consumers‡	30
	Total sample size	210

Source: *North East Arid Zone Development Program (NEAZDP)**; **Grain dealers association;*** Agricultural produce processors association; ‡ Market survey, 2012

Data were collected through interview method using structured questionnaire. Four sets of questionnaire were administered; one set to sesame farmers, the second set to sesame traders (assemblers, wholesalers and retailers), third set to sesame processors and the fourth set to consumers. The production data collected were base on 2011/2012 cropping season. The tools used for analysing the data collected for this study includes; descriptive statistics, farm budgeting techniques and value added model. Olukosi and Erhabor (2005) describe a farm budget as the detailed physical and financial plan for the operation of a farm for a certain period. Therefore, Net Farm Income (NFI) is the difference between the Gross Receipt (GR) and Total Cost (TC) of production (fixed and variable cost) denote by equations 1 through 3:

$$NFI = GR - TVC - TFC \qquad (1)$$
$$TVC + TFC = TC \qquad (2)$$

Therefore, $\qquad NFI = GR - TC \qquad (3)$

Where:

NFI	=	Net farm income (₦);
GR	=	Gross receipt (₦);
TVC	=	Total variable cost (₦);
TFC	=	Total fixed cost (₦) and
TC	=	Total cost (₦)

Value added model involves cost incurred in the process of increasing the economic value and consumer appeal of commodity. Specifically, value added model estimate the cost of value addition activities by actors on the sesame value chain and expressed as:

$$VA = C_{PT} - C_{PU} \qquad (4)$$

Where:

VA	=	value added;
C_{PT}	=	cost of purchasing transformed sesame and
C_{PU}	=	cost of sesame in its untransformed form.

Note: N denote Nigeria currency (Naira) and 1US\$ = N159 during field survey

RESULTS AND DISCUSSION

Socio-economic Characteristics of sesame farmers: Descriptive statistics of the variables employed in the study are presented on table 3. The socio-economic characteristics variables of the respondents in the study area are males dominated (84.3%) which implies that sesame production is dominated by male and this can be attributed to cultural and religious believes prevailing in the study area where female are hardly allowed to go into farming activities. The average age of 44 years and 91.2% of the respondents within the active age of between 21 - 60 agrees with the findings of Oladimeji Damisa, Abdulsalam, and Omokore (2014b) that most farmers are within their active years and can make positive contribution to agricultural production. Further analysis reveals that the average household size was about 13 people per household with a minimum of 3 and maximum of 25.

According to Makama, Murtala and Abdu (2011) household size is an ambiguous socio economic variable in agricultural production studies, as increase in household size increases the availability of family labour for farming operations, however if the bulk of the members in the household are within the unproductive age, level of production deteriorates. The result on table 3 also reveals that the minimum farm size allocated for sesame production was 2ha while the maximum was 20ha, the mean was 7 ha. This finding is in line with the findings of Makama, Murtala and Abdu (2011) citing Mohammed (2010) who reports that majority of the agricultural production is in the hands of small holder farmers. Imoh and Essien (2005) also find that farm size affects adoption of technology and that determines whether a farmer will use improved seed or not. It was found that all the farmers belong to cooperative society with average of 8 years.

Despite the fact that all the sesame farmers in the study area belong to cooperative society, the cooperatives are not strategized to assist the farmers in inputs procurement and sales of their produce. The result also reveals that majority of the respondents (70%) had no access to any form of credit in relation to sesame production with mean credit utilized found to be ₦60,700. This implies low credit availability which is in line with the findings of Oladimeji *et al.* (2013) that access to formal credit is a major constrain to farmers in Nigeria. The implication is that size of sesame

production will be low and other inputs will be affected since capital is not available to enhance production. The distribution of farmers based on number of extension contacts per year reveals that 100% of the sesame farmers have not had any extension contact. This could negatively affect their level of awareness about certain techniques that relates to the production of sesame.

Source of inputs for Sesame Farmers

This section describes the sources of inputs for the sesame farmers. The major inputs examined were; seed, organic fertilizer, inorganic fertilizer and labour.

Seed: The distribution of sesame farmers based on sources of seed is shown on table 4. The result reveals that about 84% of the farmers use to obtain their sesame seed through purchase from the local market while about 16% use to save their seed from previous season's harvest. The result also indicates that none of the farmers in the study area obtain seed from government and cooperative society. This agrees with the findings of Tiamiyu, Ibrahim and Shaahu (2013) who observe that the sources of seeds of the sesame varieties grown by farmers were mainly (42%) from previous harvest and 58% through purchase from local market. According to Ogunbile and Omidiji (2011), access to improved seeds is the key to development and growth of Agricultural sector in Nigeria; this is because seed remains the foundation of all crop production endeavours.

Labour: On table 5, the study revealed that majority (about 67%) of the sesame farmers use to employ hired labour in their farming operations, about 12% use family labour while about 22% use a combination of both family and hired labour. This agrees with the finding of Tiamiyu, Ibrahim and Shaahu (2013) who discover that most of the farming activities in sesame production are carried out manually. This necessitates the use of hired labour and a combination of both hired and family labour more than just family labour.

Inorganic fertilizer: Table 6 indicates that majority (about 62%) of the sesame farmers in the study area use to obtain their inorganic fertilizer through purchase from the local market while only about 38% obtain it from the Government through Agricultural Development Programme offices at a subsidized rate. According to Eboh, Oliver and Ebele (2006), despite application of subsidy on fertilizer by the federal government of Nigeria, nominal prices of chemical fertilizers in Nigeria are always on the increase, and according to Adediran, Akande, Taiwo and Solubo (1999), crop production has suffered a serious setback due to a general shortage and unaffordable cost of chemical fertilizers. The study identifies Producers (farmers), Marketers (assemblers, commission agents and wholesalers), Processors and Consumers as the actors on the sesame value chain in the study area (Figure 1). This agrees with the findings of Aysheshm (2007) who identifies producers, assemblers/village collectors, wholesalers, transporters, brokers, commission agents and exporters as major actors along the sesame value chain.

Producers: Farmers are the first link on the sesame value chain in the study area as shown in figure 1. They produce an average of 311.5kg of sesame per ha, this quantity is processed (threshed and winnowed), packaged in 100kg polythene bags and offered for sale. This agrees with the findings of Tiamiyu, Ibrahim and Shaahu (2013) who discover that sesame production an average of 434kg of sesame per ha on average of 4.9ha of land. Producers use to sell their sesame to assemblers without any value addition activity, assemblers use to come in contact with the producers at home or local market locations to conduct their business.

Assemblers: Assemblers are the second group of actors along the sesame value chain in the study area. The result of the study reveals that assemblers purchase 100% of their sesame from farmers, purchasing an average of 8.02 tonnes/assembler during the season under review at an average cost of ₦385,900 per tonne selling 98% of that quantity to retailers at the cost of ₦422,200 per tonne. The remaining 2% are spread on mats and sold to consumers that use to buy in 2kg measures (*mudu*) for domestic consumption at ₦422 per kg.

Commission agents: Figure 1 also shows the third group of actors along the sesame value chain in the study area (retailers). Result shows that a retailer purchased an average of 29.3 tonnes of sesame at a price of ₦422,200 per tonne, about 86% of this quantity was purchased from assemblers while about 14% was purchased directly from the farmers.

Wholesalers: The study also reveals that wholesalers, who are the fourth group of actors along the sesame value chain in the study area, purchase an average of 162.08 tonnes of sesame per season at an average price of ₦469,000 per tonne. Wholesalers in the study area use to purchase all their sesame from retailers transport to Kano where they sell to exporters and industrial processors at an average price of ₦513,000 per tonne. Retailers who also use to buy about 30% from farmers use to sell to wholesalers who are also called "bulk buyers". These bulk buyers buy and transport sesame to regional centres where it is sold to exporters, industrial processors and urban wholesalers.

Value Addition Activity: The result of the study reveals that farmers are involved in value addition activity through threshing and cleaning of seeds before packaging. Assemblers also use to perform some re-bagging which use to add value to the sesame as it pass through their hands along the chain. The other category of actors involved in value addition activities are the wholesalers who from the 162.08 tonnes of sesame they purchase per season per farmers use to sell an average of 40 tonnes (about 25%) as de-hulled sesame. The de-hulling process involve cleaning the seed, soaking it in warm water for 5 – 6 hours, sun drying, manual milling using mortar and pestle and winnowing. Local processors in the study area use to process dehulled sesame into sesame oil with sesame cake as by product.

Cost of value addition activities: The following category of actors performed some value addition activities and in the process they incurred the associated cost.

Farmers: The study reveals that farmers add value to sesame by threshing and cleaning the seeds before offering it for sale. The process involve whipping the harvested stalks on empty drums to release the capsules, this is mainly done by men, the capsules are then pound in a mortar by women to free the seeds, the chaff is separated from the seeds by winnowing and subsequent hand picking of debris to further clean the seed. The work is normally done in a team and payment is made per bag (filled and stitched) and the costs involved are as follows; whipping ₦50, pounding and winnowing ₦100, cleaning ₦40 and bagging ₦20. The total value addition cost incurred by farmers was ₦210 for every 50kg bag of sesame.

Wholesalers: Table 7 shows that the average cost incurred by wholesalers in dehulling one tonne of sesame was ₦469,217.8; this is made up of variable cost and fixed cost. The variable cost included was cost of sesame, water, firewood, labour cost and cost of packaging material amounting to ₦449,340 while the fixed cost included the cost of rent for the premises, taxes paid to the government, cost of drums, pot mount, spreading mats and mortar which is considered as depreciation value computed using straight line method with zero salvage value amounting to ₦19,877.8. Table 7 shows that the total cost was dominated by variable cost which constituted about 96% of the total cost while fixed cost accounted for about 4%. The cost of value addition was estimated by obtaining the difference between the cost of transformed sesame (dehulled) and the cost of sesame in its untransformed form and it was found to be N30,117.8. This finding agrees with the findings of Baba, Okosun and Muhammad (1998) who reveal that value addition on agricultural produce at subsistence level is dominated by variable cost.

Processors: The result on table 8 shows that the average cost incurred by processors in extracting oil from 100kg of sesame was N22,680.33; this is made up of variable cost and fixed cost. The variable cost included was cost of transportation, firewood, labour cost and cost of packaging material amounting to ₦14,036.2 while the fixed cost included the cost of rent for the premises, taxes paid to the government, cost of drums, pot mount, spreading mats and oil press which is considered as depreciation value computed using straight line method with zero salvage value amounting to ₦8,644.13. The cost was dominated by variable cost which constituted about 62% of the total cost while fixed cost accounted for about 38%.

Cost and returns on sesame production: Table 9 shows the cost and returns on sesame production. The study revealed that labour alone accounted for about 59% of the total variable cost, this shows that sesame production in the study area is labour intensive and the cost of fertilizer which accounted for about 34%. As shown on table 9, the gross margin per hectare was ₦82,367.85 and the return on every naira invested was ₦3.1 indicating that sesame production in the study area is profitable. Further analysis reveals a profit margin of 68.5% which shows the percentage of returns on

investment made by farmers in sesame production. This agrees with the findings of Makama, Murtala and Abdu (2011) who report that cost of labour constituted 86.97% of the total variable cost of sesame production per hectare where the costs of inorganic fertilizer accounted for about 9% and that farmers were making an average gross margin of ₦22,022.76 per hectare with a return of ₦1.40 for every naira invested and concluded that sesame production is profitable.

Table 3: Description of socio-economic characteristics

Variables	Unit	Mean	Maximum	Minimum
Age	years	44	70	19
Household size	number	13	25	3
Level of education	years	3.4	15	0
Cooperative membership	years	8	20	2
Access to credit	Naira	60,700	60,700	0
Farm size	Hectares	8	20	2

Source: Field survey, 2012; ð only described farmers socio-economic characteristics

Table 4: Distribution of sesame farmers based on source of seeds

Sources of seed	Frequency	Percentage
Government	0	0
Local market	86	84.3
Cooperative society	0	0
Previous harvest	16	15.7
Total	102	100

Source: Field survey, 2012

Table 5: Distribution of sesame farmers based on source of labour

Sources of labour	Frequency	Percentage
Family	12	11.8
Hired	68	66.7
Hired + Family	22	21.5
Total	102	100

Source: Field survey, 2012

Table 6: Distribution of sesame farmers based on source of inorganic fertilizer

Sources of seed	Frequency	Percentage
Government	39	38.2
Local market	63	61.8
Cooperative society	0	0
NGO*	0	0
Total	102	100

Source: Field survey, 2012; *Non-Governmental Organization*

Table 7: Average cost of dehulling 1 tonne of sesame (₦)

Variables	Qty (kg)	Unit price (₦)	Value (₦)	% of TC
Cost of sesame	**1000**	**439.1**	**439,100**	**93.6**
Water	12 cans	20	240	0.05
Firewood			500	0.11
Labour:				
Soaking and spreading	1000	0.4	400	0.08
Milling and winnowing	1000	0.8	800	0.17

Watching and warding	1000	0.5	500	0.11
Bagging and standardization	1000	0.4	400	0.08
Packaging material:				
Polythene lining	20 pieces	30	600	0.1
Polythene bags	20 pieces	70	1,400	0.29
Transportation	1000	5.4	5,400	1.15
A. Total variable cost			**449,340**	**95.76**
Fixed cost:				
Depreciation			4,877.8	1.03
Rent			14,000	2.98
Tax			1,000	0.21
B. Total fixed cost			**19,877.8**	**4.23**
C. Total cost (A+ B)			**469,217.8**	**100**
Cost of value addition			**30,117.8**	

Source: Field survey, 2012; *Depreciation on drums, pot mount, spreading mats and mortar*

Inputs flow

Flow of untransformed sesame

Flow of transformed sesame
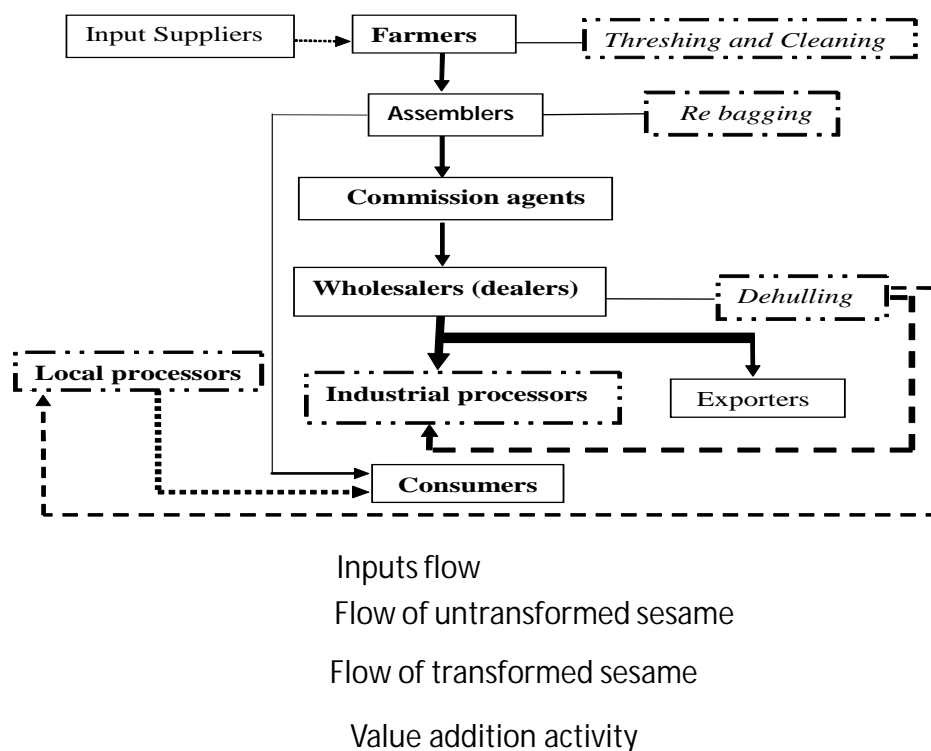
Value addition activity

Figure 1: Structure of sesame value chain in the study area

Table 8: Average cost of expressing oil from 100kg of sesame (₦)

Variables	Qty (kg)	Unit price (₦)	Value/ha(₦)	% of TC
Transportation			142.5	0.63
Firewood			493.7	2.17
Labour:				
Frying			2,000	8.81
Grinding			2,500	11.02
Heating and mixing			4,000	17.6
Pressing			1,500	6.61

Packaging material:

Plastic containers	17	200	3,400	14.9
A. Total variable cost			**14,036.2**	**61.8**
Fixed cost:				
Depreciation			2,644.13	11.7
Rent			5,000	22.04
Tax			1,000	4.40
B. Total fixed cost			**8,644.13**	**38.1**
C. Total cost of value (A+ B)			**22,680.33**	**100**

Source: Field survey, 2012 *Depreciation on utensils, pot mount, table, oil press and basins*

Table 9: Average Cost and Returns of sesame production per hectare

Variables	Qty (kg)	Unit price (₦)	Value/ha(₦)	% of TVC
Seed (kg)	4.6	450	2,070	5.5
Fertilizer (kg)	100	65	13,000	34.4
Labour (man day)	55.7	400	22, 280	58.9
Packaging material	7	70	490	1.3
A. Total Variable Cost			37,840	100
B. Total revenue Yield (kg)	311.5	385.9	120,208	
C. Gross Margin (B-A)			82,367.9	
D. Profit Margin (C/B*100)			68.5%	
E. Gross ratio (A/B*100)			31.5%	
F. Return on Investment (B/A)			3.1	

Source: Field survey, 2012; TVC denote Total Variable Cost

CONCLUSION AND RECOMMENDATIONS

Along the sesame value chain, farmers are making a return on investment of ₦3.1 which is higher than that of all other actors along the chain. Value addition activity increases both the variable and fixed cost of the actors along the chain, for instance average total cost of extracting oil and dehulling from 1 tonne of sesame amount to ₦22,680 and ₦30,118 respectively. There is need for sesame farmers in the study area to re strategize and reposition their cooperative societies for ease of input procurement and strategic marketing of the commodity. Training of sesame farmers through cooperative societies by agricultural extension services on improved method of sesame production and provision of information to farmers and traders on current world trend in sesame prices and demand as well as technologies can motivate production and consequently increase acreage.

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