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

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Abstract:
The study analyses value chain of sesame in two Local Government Areas of Yobe State, Nigeria. It specifically examined the socio-economic characteristics of the sesame farmers; characteristics and roles of value chain actors in sesame as well as the profitability of production, processing and marketing of the commodity. 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 ₦82,367.85 with the return on every naira invested amounting to ₦3.1. 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.

Keyword: *Value chain analysis sesame*

1. Introduction

Agriculture constitutes a significant sector of Nigeria's economy, until 1970, agricultural exports were the main source of foreign exchange earnings (Amaza and Olayemi, 2016). Agriculture provides employment opportunities, increase rural income and improve the welfare of the people (Clevance, 2014; Jhingan, 2015). 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 synergy to asphyxiate the sector resulting in low production (Okuneye, 2017). Olukosi and Abdulrahaman, (2014) attributed the decline in productivity of the agricultural sector to serious neglect of the sector following the rise in the price of crude oil over the years.

Jama'are (2016) reported that despite the discovery of oil in the early 1970s, the agriculturalsector is still the most important sector of the national economy in terms of rural employment, provision of food and export earnings. It provides employment to about two-thirds of Nigeria's adult labor force (CBN, 2016). It still provides 88% of non-oil earning out of which crop production takes 51% (Economic Associate,2015).

USAID in collaboration with the Federal Ministry of Agriculture and the Nigeria Export Promotion Council (NEPC) at a summit held in Abuja, Nigeria in January 2012 identified and recommended 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 (*sesanum indicum*) 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 stem. When ripe, the capsule shatters to release a number of small seeds. 1000 seeds weigh about 4-8g (Export Product Profile, 2014). According to Ashri (2012), 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^{o}C for optional growth (Weiss, 2018).

Sesame production in Nigeria have increased from 600,000 metric tonnes in 2005 to 750,000 metric tonnes in 2016 and an estimated 334,688 hectares of arable land suitable for its cultivation is currently under production in the country (FAO, 2016). But industrial processing and utilization of sesame have not been fully developed in Nigeria, however the product is locally processed and utilized in various forms in the states where the crop is cultivated. Principal among the products is; 'Kunumridi', the sesame oil which is extracted from the seed and the cake is made into 'kulikuli'. Mshelia*et al* (2012) stated that sesame as an oil crop is used in many ways with about 65% of the annual production being processed into oil, and 35% used as food, the food segment includes about 42% roasted sesame, 36% washed sesame, 12% ground

sesame and 10% sesame roasted with salt. Sesame can also be roasted and sprinkled on pan cakes, chin-chin and donuts, and is also commonly used for soup thickening condiment in the producing areas of Nigeria (Falusi, 2018).

1.1. Problem statement

Nigeria in her quest to be among the world's 20 largest economies 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 are poverty-stricken living on less than US $1 per day hence living below the United Nations poverty line (World Bank, 2006). This poverty use to manifest in greater proportion among small scale farmers in the form of low income and living standard, poor nutrition, poor housing and health (FAO, 2007). 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*et al.,* 2016).

Agriculture is viewed as panacea for poverty reduction especially through the production of high value crop like sesame which use to give the highest return per unit of input than all other cash crops cultivated by farmers because for every ₦1 invested on sesame production, ₦2.62 is realized (Iwo and Idowu, 2008). On the global scale Nigeria ranks second to Sudan in production and export of sesame with a world market share of 4% equivalent to ₦12.8 billion and exporting about 1,700 metric tonnes to Europe and 22,000 metric tonnes to Japan (NEPC, 2014).

According to NEAZDP (2015); 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 and marketing but its production in the study area is on the decline as evident by the crop yield area survey (CAYS) conducted by Yobe State Agricultural Development Program (YOSADP).

Year	Area (Ha)	Yield (Metric Tonnes)
2012	2550	20,200
2013	3890	16,400
2014	3100	12,800
2015	2900	11,000
2016	2890	10,660
2017	2246	9,500

Table 1: Crop Area Yield Survey (CAYS) of Sesame in the Study Area
Source: Yobe State Agricultural Development Program, 2019

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 700,000 tonnes per year having risen from 427,000 tonnes per year in 2012 (FAO, 2016). Furthermore, the prices of sesame have also been on the rise, from ₦200,000 per tonne in 2010 (CHEMONICS, 2018) to ₦330,000 per tonne in 2018 (Nigerian Agricultural Products Prices, 2018). Despite these favourable trends in the global production and marketing of sesame, the production and consequently processing and marketing activities of sesame in the study area is on the decline. It is against this back ground that this study will attempt to examine the economics of sesame production to provide answers to the following questions:

- What are the socio-economic characteristics of sesame farmers;
- What are the characteristics and roles of value chain actors in sesame production and marketing and
- What is the average cost and returns (profitability) of sesame production per hectare in the study area?

1.2. Objectives of the Study

The broad objective of this study is to analyze the value chain of sesame in Bade and Jakusko Local Government Areas of Yobe state. The specific objectives are to:

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

1.3. Justification of the Study

Poverty has been suggested by many empirical evidences as the area of great concerns to policy makers in developing countries. Nigerian farmers have a great potential for better living standard than currently experienced; better marketing of agricultural produce is one important aspect in the development process because we cannot have more production unless what is produced are actually sold out and selling depends on the proper marketing conditions (Prasad and Prasad, 2005).

The study result would also provide general information on sesame production and processing for decision makers, planners and other stake holders involved directly or indirectly in promoting agriculture. Besides, it will provide valuable information to formulate marketing development programmes especially those with pro-poor perspective. Furthermore, the study will add to the existing knowledge on sesame value chain in the study area.

2. 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 772km2 and with a population of 139,782 and Jakuskoa total land area of 3,941km2 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 39oC and 42oC with average annual rainfall of 500mm-1000mm (NEAZDP, 2017).

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: four from Bade and five 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, (Bade) and Gasamu, Girgir, Dachia, Buduwa, Jakusko, (Jakusko LGA).

Respondents	Sample size
Farmers*	102
Assemblers**	32
Whole sellers**	30
Retailers**	20
Processors***	26
Total Sample Size	210

Table 2: Summary of the Total Sample Size Selection in the Study Area
*Source: *North East Arid Zone Development Program (NEAZDP),*
Grain Dealers Association; Agricultural Produce Processors Association; ǂ Market Survey, 2019*

Data were collected through interview method using structured questionnaire. Four sets of questionnaires 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 2018/2019 cropping season. The tools used for analyzing 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) denotes by equations 1 through 3:

NFI = GR – TVC – TFC (1)
TVC + TFC = TC (2)
Therefore, NFI = GR – TC (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 = CPT – CPU (4)

Where:
VA = value added;
CPT = cost of purchasing transformed sesame and
CPU = cost of sesame in its untransformed form.

3. Results and Discussion

3.1. 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 is 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, (2014) that most farmers are within their active years and can make positive contribution to agricultural production.

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

Table 3: Description of Socio-Economic Characteristics
Source: Field Survey, 2019

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, (2017) 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 (2017) citing Mohammed (2015) who reports that majority of the agricultural production is in the hands of small holder farmers. Imoh and Essien (2015) 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*. (2014) 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.

3.2. Actors along the Sesame Value Chain and their Roles

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 (2017) who identifies producers, assemblers/village collectors, wholesalers, transporters, brokers, commission agents and exporters as major actors along the sesame value chain.

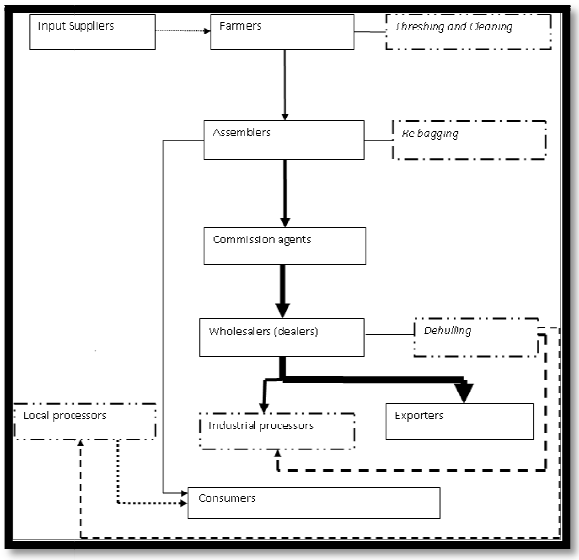

Figure 1: Structure of Sesame Value Chain in the Study Area

3.2.1. 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 (2016) 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.

3.2.2. 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.

3.2.3. Commission Agents

Figure 1 also shows the third group of actors along the sesame value chain in the study area is 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.

3.2.4. 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 and transport it 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.

3.2.5. 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 passes 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.

3.2.6. Cost of Value Addition Activities

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

3.2.7. Farmers

The study reveals that farmers add value to sesame by threshing and cleaning the seeds before offering it for sale. The process involves 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.

3.2.8. Wholesalers

Table 4 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 3 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 ₦30,117.8. This finding agrees with the findings of Baba, Okosun and Muhammad (2008) who reveal that value addition on agricultural produce at subsistence level is dominated by variable cost.

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				

Table 4: Average Cost of Dehulling 1 Tonne of Sesame (N)
*Source: Field Survey, 2019; *Depreciation on Drums, Pot Mount, Spreading Mats and Mortar*

3.2.9. Processors

The result on table 5 shows that the average cost incurred by processors in extracting oil from 100kg of sesame was ₦22,680.33; 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%.

Variables	Qty (kg)	Unit price (₦)	% of TC
Transportation	100	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 Addition (A+ B)		**22,680.33**	**100**

Table 5: Average Cost of Expressing Oil from 100kg of Sesame (₦)
*Source: Field Survey, 2019 *Depreciation on Utensils, Pot Mount, Table, Oil Press and Basins*

3.2.10. Cost and Returns on Sesame Production

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	1 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**

Table 6: Average Cost and Returns of Sesame Production per Hectare
Source: Field Survey, 2019; TVC Denote Total Variable Cost

Table 6 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 N3.1 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 (2017) 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.

4. 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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