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## Research Article

# Assessment of Value Chain Governance and Preference Along Sesame Value Chain in North-Western, Nigeria

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### Abstract

**Background and Objective:** Owing to the paradigm shift in interest to use the value chain approaches to promote agricultural products competitiveness, increase the wealth of actors and an understanding of the factors and activities involved from conception to consumption of a product. The study assessed the sesame value chain governance and preferences in North-Western Nigeria. **Materials and Methods:** A multi-stage sampling procedure was adopted to select a total of 138 sesame value chain actors (farmers, traders, processors and exporters) using a combination of purposive and random selection techniques. The data were collected using questionnaires and subjected to descriptive statistics and hedonic regression analysis. **Results:** The result shows that sesame price control along the value chain was in the hands of traders (59.4%), followed by exporters with 23.2%. Similarly, traders (54.3%) bargained higher than the other actors in the sesame value chain. In terms of the value chain governance, the traders (65.2%) controlled the market information flow higher than the other actors. Similarly, smaller seed sizes ( $p < 0.01$ ) and local seed varieties ( $p < 0.05$ ) were found to be statistically significant concerning preference. **Conclusion:** Seed colour, size, variety and composition with foreign bodies were the physical characteristics affecting sesame preference and prices along the value chain. Thus, to improve efficiency, the sesame value chain should be well developed to incorporate financiers and other regulators.

**Key words:** Actors, assessment, sesame, value chain, governance, preference, rural poverty

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

Nowadays, there is a growing interest to promote value chains as a way to add value, diversify rural economies and contribute to the rural household incomes in Sub-Saharan Africa (SSA) and Nigeria in particular. Value chain analysis is increasingly recognized as a means to reduce the rural poverty prevalent in the region<sup>1</sup>.

Nigerian agricultural export remains dominated by primary and semi-processed commodities and the share of agriculture in Nigerian export has declined sharply in the last four decades. Despite this trend, agriculture remains one of the major export-revenue sources next to crude oil and the largest income generator for its population. To avert the aforementioned situation, value chain approaches and analysis are now employed to holistically change the scenario and at the same time provide a better option for food and fibre production and consumption.

Sesame popularly known as "Beni seed" is widely grown in the Northern and Central zones of Nigeria with large portions in Jigawa, Kaduna, Katsina, Taraba, Benue, Kogi and the Nasarawa States. It is mainly grown as one of the major export crops<sup>2,3</sup>.

Value chain governance entails the type of power relations that exist and the pattern of information sharing among chain actors. The value chain is viewed as a conductor enhancing information flows between various actors in the chain, which has resulted in quite a several governance debates. These governance issues have everything to do with the complexities of power relations within the chain, which determine how financial, material and human resources are allocated and flow within the chain<sup>4</sup>. Two types of governance structures within the chain are identifiable, these are, the producer-driven chain (with interlinked firms) and the buyer-driven chain, which does not consist of firms but is interlinked, consisting of groups of local farmers and businessmen. Thus, it would help in unravelling the actors with the most control over the activities.

Accordingly, governance was defined as a description of the dynamic distribution of power, learning and benefits among a value chain's firms<sup>5</sup>. In the same vein<sup>6</sup>, governance was defined as the power to control, influence, set the modes and rules of interaction in value chains. While the term can have many meanings, it describes the sharing of information and systematic standards promoted by the "Governing" entity in a value chain. It was reported that certain key actors-the lead firms or "Governors of value chains" have the capability and power to define and set the parameters of contracts and subcontracts in the chains<sup>6</sup>.

It was reported that agricultural commodities are still exported in raw form with no or little value addition, post-harvest losses due to inadequate storage and timely exit to markets and end-users, input supply not under farmer's control but the control of politicians and middlemen, thereby increasing costs and delays in operations<sup>1</sup>. Moreover, the farmers are affected by the low price, because product prices are generally low at harvest and begin to appreciate when the season pass by, high prices are mostly realized during the lean supply period and they rarely take advantage of these seasonal price differences because of limited income to cover their financial commitments, which in most cases have to be settled soon after harvest<sup>7</sup>.

The capacity to process sesame both in terms of quantity and quality is inadequate because processors lack relevant processing equipment, the products are also of low unit value while processing is limited to cleaning and in a few cases de-hulling. Marketing is also bedevilled with many layers of middlemen, high occurrence of physical losses, high marketing costs coupled with market information being insufficient and adulterated products. Similarly, grades, standardization and quality control are inadequate, as such buyers are left to do away with what is available and presented to them than making a choice<sup>8</sup>.

The value chain governance from production to the consumption and or export markets needs to be assessed especially given identifying the actors with the highest influence to price control, power of price bargain and control of market information. Hence, the study seeks to identify the actors who exerted influence (governed) on the value chain and the attributes of sesame preferred by the actors at both upstream and downstream levels of the chain.

## MATERIALS AND METHODS

**Study area:** The study area is North-Western Nigeria, specifically around the Jigawa-Kano axis, because Jigawa State is prominent for most of the production in the zone, Kano State was selected for its role in sesame marketing in which processing and exports activities were incorporated. Specifically, the Dawanau Market in Kano was studied because of its role as the export market for sesame commodities in the zone. The study was carried out in Jigawa and Kano State of Nigeria between the 2016-2017 seasons.

Jigawa State lies between longitudes 8.00°E to 10°15'E and latitudes 11.00°N and 13.00°N in the Sudan Savanna with traces of Guinea Savanna in the Southern part of the State<sup>9</sup>. It has a population of 4,361,002 and a projected population of 5,790,329 in 2015 representing 3.2% of the annual growth rate<sup>3</sup>, with about 80% of the population engaged in crop and animal agriculture.

Kano State is situated in the Sudan Savannah agro-ecological zone of Nigeria located between longitudes 7°34'E to 9°25'E and latitudes 9°30'N to 12°37'N. The State has a population of 9,383,682 and a projected population of 12,459,251 in 2015 representing an annual growth of 3.2%<sup>3</sup>. Historically, it is an agricultural and commercial area that was known for groundnut production and trading, inter-regional trade and a major commercial hub in Northern Nigeria.

**Sampling procedure:** The design of the research was based on the Jigawa State Agricultural Development Project (ADP) zonation, the State was divided into 4 Agricultural zones (Birnin Kudu, Hadejia, Gumel and Kazaure) for good representation. A multistage sampling technique was used. The first stage was the purposive selection of three agricultural zones of the ADP (Birnin Kudu, Hadejia and Gumel) because of their high status in the production and marketing of sesame in the State. The second stage involved the purposive selection of two Local Government Areas (LGAs) within a zone, i.e., those with the highest sesame production. Dutse and Kiyawa in Birnin Kudu Zone, Taura and Garki in Gumel Zone while Kafin Hausa and Kaugama in Hadejia Zone. Two communities (highest in sesame production) were purposively selected from each of the six LGAs making a total of 12 communities. These are, Kargo and Yargaba (Dutse), Katanga and Garko (Kiyawa), Kwalam and Chakwaikwawa (Taura), Garki and Kaya (Garki), Bulangu and Ruba (Kafin Hausa) and Dadori and Dalarin Lungu (Kaugama). Five sesame farmers were randomly selected from each of the selected communities making a total of sixty farmers that participated in the study at the entry point.

Traders' names were collected from the farmers and formed the sampling frame from which thirty-six number traders were randomly selected and participated in the study. Similarly, processors' names were collected from the traders and hence the processor's sampling frame evolved. Thirty-six processors' names were collected from the traders and were all selected for the study. Similarly, as a chain, six exporters were sourced from traders and also all were selected because of their limited number. Thus, a total of 138 respondents formed the sampling size of the study.

**Data collection and analysis:** Data for the study were collected using structured questionnaires by the researcher with the assistance of trained enumerators. Data collected include information on the socio-economic characteristics such as age, household size and years of experience. Other information collected was on input-output relationships such as farm size, hired labour,

amount of seed, fertilizer, pesticide, cost and returns, marketing cost/value addition, price control, bargain and flow of information of the actors (farmers, traders, processors and exporters).

Descriptive statistics (percentages, means and frequency), governance matrix and hedonic regression were used to analyze the data.

**Hedonic pricing econometric model:** Hedonic pricing econometric model was employed by researchers<sup>7,8</sup> which makes use of the consumer goods characteristic model. Table 1 depicts the coded physical attributes employed in the study. Hedonic pricing econometric model describes the price of a good as a linear summation of the implicit value of its attributes. Therefore the commodity characteristics model for sesame is mathematically expressed as:

$$P_s = \sum_{j=1}^M X_{sj} P_{sj} \quad (1)$$

Where:

$P_s$  = Price of sesame

$X_{sj}$  = Sesame characteristics  $j$ , such as grain size, colour, presence or absence of foreign material such as sand and seed of other plants

$P_{sj}$  = Price of characteristics  $j$

**Hedonic regression:** Hedonic regression using SSPS version 16.0 was used to determine the effect of sesame physical characteristics on price and VCAs choice. It should be noted that the hedonic regression analysis essentially involved comparing variables along the same regression line and also comparing them between average situations within variables, the indicator with the highest frequency was used as the baseline for comparison and therefore did not appear in the regression<sup>7,8</sup>.

The hedonic regression model used was specified in the general form as:

$$Y = f(X_1, X_2, X_3, X_4, u) \quad (2)$$

Where:

$Y$  = Price paid for sesame (N)

$F$  = Functional notation

$X_1$ - $X_n$  = Independent or explanatory variables

$U$  = Error term

Table 1: Coding key for sesame seed physical characteristics

Variables	Coding
Seed size	Small (<2 mm)
	Big (2.1-3.5 mm)
Seed color	White
	Brown
Seed variety	Improved
	Local
Seed source	Dan Kano
	Dan Maiduguri
	Dan Lafiya
Seed composition	Below 5% foreign material
	Above 5% foreign material

As derived from the equation above:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + U \quad (3)$$

Where:

- Y = Price paid for sesame (N)
- a = Intercept
- b<sub>1</sub>-b<sub>5</sub> = Coefficient of Xs
- X<sub>1</sub> = Variety of sesame
- X<sub>2</sub> = Sesame seed size (mm)
- X<sub>3</sub> = Sesame seed color (color chart μm)
- X<sub>4</sub> = Sesame seed source (location)
- X<sub>5</sub> = Sesame seed composition (level of impurity)
- U = Error term

From the regression analysis of these parameters, R<sup>2</sup> value, the number of significant independent variables and the p-values were determined.

## RESULTS AND DISCUSSION

### Matrix of governance by sesame value chain actors (VCAs):

Table 2 presents the matrix mapping of Value Chain Actors' (VCAs) responses to the variables of governance is price control, price bargain and information control. The result shows that sesame prices along the chain are being controlled by traders (59.4%). Sesame traders exert control over the price of sesame along its value chain, this may be for the fact that they collude and set the price for the sesame in the markets and for which the farmers have to accept. This agrees with a research finding<sup>9</sup> that farmers are price takers since they do not control the price of the sesame.

The ability to bargain price is an important factor in agricultural commodity marketing and in determining value chain governance. It connotes the stake a marketing actor has in the price formation. Table 2 further shows that sesame traders (54.3%) bargained higher than other actors in the sesame value chain. This may be because sesame traders

make use of their ability and network to source the commodity irrespective of location and time, sells it to the other actors in the downstream, cleaners and the export companies. This finding agrees with a report<sup>4</sup> that farmers collect what was offered to them by the dealers as the proceeds of the sale of their commodity. According to this reasoning, sesame farmers do little or no bargain on the price of the commodity but take the price offered to them by the traders. This is not surprising because these actors performed their activities in the downstream level of the value chain and at times are into trader's associations.

Additionally, the result reveals that market information as a variable of value chain governance was found to be controlled by the traders. This finding was not surprising because of what was described as a hierarchical relationship existing in a value chain governance where the buyers took hold of all operations carried out due to the low competence of the suppliers, not just at the production level but in all other areas<sup>10</sup>. Moreover, for the fact that the traders link up with exporters as multinational companies that tend to collude and dictate the sesame marketing activities.

Additionally, sesame exporters through the traders set the price of sesame along the chain. This finding may not be surprising because the sesame exporting companies set the buying price of the commodity through the traders which in turn affects the price of sesame both at the upstream and the downstream sectors of the value chain. This finding is not far from a priori expectation for the fact that exporters through the traders came out with specifications and other information as regards the sesame marketing each season and from that every other actor in the chain based and set transactions<sup>2</sup>.

### Preference of sesame characteristics by the value chain actors:

Sesame attributes studied comprise seed variety (local or improved), seed size (small or big), seed colour (white or brown), seed source (location) and seed composition with foreign materials. These characteristics affect its choices and prices among the sesame value chain. Results of the value chain actor's preferences are presented in Table 3-5.

Table 3 shows that 82% of the sesame farmers preferred big sized sesame seed for an easy sale, while 18% had a preference for small size seed. White-coloured (87%) were preferred by the farmers compared to brown with only 13%. This was because white seeds are preferred by traders (easy marketing). In terms of variety, the majority of the farmers (79%) preferred improved to local cultivar because comparatively, it yields higher than the local variety.

Table 4 shows that 69% of the traders prefer big sized seed as they sell better in the market, while 31% of

Table 2: Matrix of governance by sesame VCAs

Actors	Variables		
	Price control	Price bargain	Market information
Producers	9.4 (13)	24.6 (34)	18.1 (25)
Traders	59.4 (82)	54.3 (75)	65.2 (90)
Processors	8.0 (11)	6.5 (9)	5.8 (8)
Exporters	23.2 (32)	14.5 (20)	10.9 (15)

Values in parenthesis are frequencies

Table 3: Farmer's preference to sesame seed physical characteristics for planting

Sesame attributes	Frequency	Percentage (%)
<b>Seed size</b>		
Small	11	18.3
Big	49	81.7
<b>Seed colour</b>		
White	52	86.7
Brown	8	13.3
<b>Variety</b>		
Local	13	21.7
Improved	47	79.3

Table 4: Trader's preferences to sesame physical characteristics

Sesame attributes	Frequency	Percentage (%)
<b>Seed size</b>		
Small	11	30.6
Big	25	69.4
<b>Seed colour</b>		
White	30	83.3
Brown	6	16.7
<b>Seed source</b>		
<i>Dan Kano</i>	20	55.6
<i>Dan Maiduguri</i>	9	25
<i>Dan Lafiya</i>	7	19.4

Table 5: Processor's preferences for sesame physical characteristics

Sesame attributes	Frequency	Percentage (%)
<b>Seed size</b>		
Small	25	69.44
Big	11	30.56
<b>Seed colour</b>		
White	30	83.3
Brown	6	16.7
<b>Seed composition</b>		
Below 5% foreign bodies	28	77.7
Above % foreign bodies	8	22.3

them goes for small size seed. About 83% of the traders prefer white sesame compared to 17% that prefer brown seed, the reason for this was that white sesame cleaned earlier than brown and hence this entails added cost to the cleaner. Similarly, 56% of the traders prefer *Dan Kano* by location than the sesame from other locations. The reason for the preference of *Dan Kano* may be due to lower transportation charges from the location of production as *Dan Kano* is comparatively closer to the Dawanau market than the *Dan Maiduguri* or *Dan Lafiya*.

Table 5 showed that 69.4% of processors prefer small-sized seed because it tends to be more in quantity per unit of measure hence more surface area and volume for snack making, while 31% had a preference for big size. About 83.3% preferred white coloured and 78% had a preference for sesame with below 5% foreign bodies. The reason for the processors for white seed and those below 5% foreign bodies by composition is that it is more attractive to consumers and also health wise the sesame with no sand cannot cause appendicitis<sup>9</sup>.

**Hedonic regression of sesame value chain actors:** The result of the estimated Hedonic regression compared the prices of sesame with its physical characteristics, the price as the dependent variable while sesame's physical characteristics as independent variables. Hedonic regression results of the actors are presented in Table 6-8.

The result of the estimated hedonic regression that compared the prices of sesame is presented in Table 6 with price as the dependent variable while sesame physical characteristics as the independent variables. The size of the seed was entered with two variables dummies (big and small size), but big was the reference group: The colour was also entered as white and brown with white as the reference group. Variety was entered as improved or local with improved as the reference group.

The result shows an R<sup>2</sup> of 56.7%, indicating that 56.7% of the variation in the price of sesame seed was explained by the explanatory variables included in the model. Big size sesame seed was compared with small size seed, the result shows that small seed was found to be statistically significant at probability (p<0.01). This implied that there was a difference in prices between the big and small seed hence, the prices of the big size seed was higher than the small size seed which may be due to the high demand of the commodity and especially during planting when the seed is scarce, this agrees with the findings of Katanga *et al*.<sup>1</sup> Further, the result indicated that local variety was also found to be statistically significant at p<0.05. This means that improved variety was sold at a higher price than the local variety which is cheaper

Table 6: Hedonic regression of sesame characteristics affecting farmer's choice

Variables	Coefficient	t-ratio	p-value
Constant	378.569	21.36	0.000***
<b>Sesame seed size (X<sub>1</sub>)</b>			
Big	9.453	2.579	0086*
<b>Sesame colour (X<sub>2</sub>)</b>			
Brown	-34.128	-0.337	0.271 <sup>NS</sup>
<b>Seed composition (X<sub>3</sub>)</b>			
Below 5% foreign body	10.063	3.965	0.007**

R<sup>2</sup>: 0.567, R<sup>2</sup> adjusted: 0.406, \*\*p<0.01, \*p<0.05 and NS: Not significant

Table 7: Hedonic regression of sesame characteristics affecting trader's choice

Variables	Coefficient	t-ratio	p-value
Constant	288.519	14.01	0.000
<b>Sesame seed size (X<sub>1</sub>)</b>			
Small	6.643	1.75	0.078*
<b>Variety of sesame (X<sub>2</sub>)</b>			
Local	18.217	8.16	0.004**
<b>Sesame colour (X<sub>3</sub>)</b>			
Brown	-21.972	-0.1230	0.170 <sup>NS</sup>

R<sup>2</sup>:0.587, R<sup>2</sup> adjusted: 0.438, \*p<0.01, \*\*\*p<0.001 and NS: Not significant

Table 8: Hedonic regression of sesame characteristics for processor's choice

Variables	Coefficient	t-ratio	p-value
Constant	1514.467	3.936	0.000***
<b>Sesame seed size (X<sub>1</sub>)</b>			
Small	-40.473	-2.180	0.337 <sup>NS</sup>
<b>Sesame colour (X<sub>2</sub>)</b>			
Brown	8.281	1.464	0.053*
<b>Seed source (X<sub>3</sub>)</b>			
<i>Dan Maiduguri</i>	23.67	1.974	0.081*
<i>Dan Lafiya</i>	0.368	0.257	0.179 <sup>NS</sup>

R<sup>2</sup>: 0.614, R<sup>2</sup> square adjusted: 0.572 \*p<0.05 and NS: Not significant

this may be due to the improved variety out-yielded the local type as confirmed by the farmers. Additional reasons for this may not be unconnected with the fact that improved seed was accessed from certified seed companies who sold at a higher price compared to local seed obtainable in the open market. Brown coloured seed was statistically insignificant, this means that the farmers were indifferent to the colour of the seed, though the majority prefer white coloured due to scarcity at the time of planting, farmers made use of what was available to them, hence this confirmed their seed source from the market or saved from the previous harvest. The findings are in agreement with the report of Tiamiyu *et al.*<sup>9</sup>.

Estimation of hedonic regression of sesame trading compared the prices of sesame as the dependent variable while sesame physical characteristics as independent variables. The size of the seed was entered with two variables dummies (big and small size), big was the reference group: The colour was also entered as white and brown with white as the reference group. Seed sources were entered as *Dan Kano*, *Dan Maiduguri* or *Dan Lafiya* with *Dan Kano* as the reference group.

An estimation of hedonic regression results in Table 7 shows that 58.7% (R<sup>2</sup> = 0.587) of the variation in the price of sesame was explained by the explanatory variables included in the model. These variables were the seed size, colour, as well as seed source. The remaining 42.3% of the variation was due to error distribution. Small-sized sesame seed was found to be statistically insignificant. This implied that traders were indifferent to the seed size of sesame, as such they purchase seed regardless of the seed size because of bulking and wholesaling activities. The result further shows that brown seed was found to be statistically significant at the probability of 10%, this implied that prices of the white seed were higher than the brown seed as such the traders discounted the brown seed and paid a premium to the white sesame seed. Similarly, a comparison of the sesame seed in terms of its source revealed that *Dan Maiduguri* was statistically significant at the probability of 10% while *Dan Lafiya* was not. This result implies that *Dan Kano* was sold at a higher price than the *Dan Maiduguri* but *Dan Kano* and *Dan Lafiya* were found sold at the same price. Meaning that the traders were ready to discount *Dan Maiduguri* but pay a premium to

*Dan Kano and Dan Lafiya.* The finding is in harmony with the works of Katanga *et al.*<sup>1</sup> and Musa *et al.*<sup>7</sup>

Result of estimated hedonic regression of processors compared the prices of sesame with physical characteristics, sesame price as the dependent variable while sesame physical characteristics as the independent variables. The size of the seed was entered with two variables dummies (big and small size) but small was the reference group: The colour was also entered as white and brown with white as the reference group. Seed composition was entered as composition below 5% foreign bodies and composition above 5% foreign bodies with the latter as the reference group.

Table 8 shows that 61.4% of the variation in the price of sesame seed was explained by the explanatory variables included in the model. These variables were the seed size, seed colour and seed composition with dirt. The remaining 38.6% was not explained by the included variables, meaning that sesame physical characteristics influenced the prices processors paid for the commodity. Big size sesame seed was compared with small size seed, the result shows that big size seed was found to be statistically significant at probability  $p < 0.05$ . This implied that the prices of the small size seed were lower than the big size seed which may be because small seeds weigh heavier because of volume than the big seed as adduced by processors. Seed colour was not found significant in explaining the price of sesame by the processors, this means that processors were indifferent to colour when paying for the sesame price. The finding was in contrast to the works of Musa *et al.*<sup>7</sup> who reported actor's sensitivity to the colour of the product.

Sesame seed composition with below 5% level of dirt inclusion (10.063) was found to be positive and statistically significant at  $p < 0.01$ . By implication, processors preferred sesame seed with the composition of dirt below 5% and paid a premium for it, while those with composition above 5% were discounted and or returned to the suppliers for re-sieve. Similarly, this sesame is safer for human consumption as seed mixed with sand can cause appendix problems.

From the findings of this study, it was recommended that productivity and production of the sesame could be enhanced through increased utilization of improved varieties of sesame with desired characteristics. Additionally, the provision of well-managed contract farming/transaction can be used as an effective way to coordinate and promote the value chain of quality sesame for use by domestic industries and export since all the actors in the value chain will benefit from the techniques adopted.

## CONCLUSION

The sesame value chain was found to be governed by the traders being the major actors who controlled sesame price, market information flow and bargain better and above other actors in the chain. In the same vein seed colour, size, variety and composition with foreign bodies were the physical characteristics identified to influence sesame preference and prices along the value chain.

## SIGNIFICANCE STATEMENT

The study discovers the price control was in the hands of the traders as against the perception that, exporters cartel and influence the price of the sesame and information in the sesame value chain. Additionally, it was identified that the marketers preferred small-sized seed against big-sized ones, this is surprising, however, according to this reasoning small-sized seed weighs higher than big-sized ones and the weight translates into higher oil content. This study will help the researcher to uncover the critical areas of preference of small-sized seeds of sesame among the traders as it attracts a high premium in the market, which many researchers were not able to explore. Thus, a new finding will enable the seed company and farmers to produce what is needed upstream of the value chain.

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