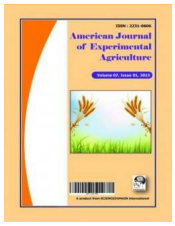

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The Quantity of Shea Nut Assessed, Collected and Processed Using Improved Shea Nut Processing Technologies in Niger State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study assessed the quantity of Shea nut Assessed, collected and processed using improved Shea nut processing technologies in Niger State. The specific objectives of study were to; describe the socio economic characteristics of the Shea nut processors, determine the quantities of Shea nut/butter produced by the processors and income generated, and examine the constraints faced by the processors in adopting Shea nut processing technologies in the study area. A total of 150 Shea nut processors were selected randomly. Primary data were collected and analyzed. The result revealed that Shea nut processing activities were mainly women business and that the processors collected above 500,000 kg of Shea nut from the wild plantation of Shea trees in their communities and processed above 800 kg into Shea butter in a year which served as a source of income. It is recommended that Shea stakeholders in processing and marketing should interact with Nigerian Institute for Oil palm Research (NIFOR) that has the national mandate on Shea tree research and development to produce sufficient quantity of hybrid/improved Shea tree seedling varieties for modern plantation establishments.

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1. INTRODUCTION

Shea tree (*Vitellaria paradoxa*) grows in a large part of sub-Sahara Africa. The tree is important for the livelihood of rural population for centuries. Almost every part of Shea tree are useful for example, the fruit is eaten and the leaves are used as fodder for livestock and serve as an ingredient for making alkaline and paint for industrial purposes [1].

African exports of Shea butter have increased to 3200MT in year 2000. A Major Shea nut importers in recent years were Belgium, Denmark, Japan, the Netherlands, Sweden and the United Kingdom [2].

Nigeria is the leading producer of Shea nut: 355,000MT produced in 1999, 58% of the African production, but 10,000MT lower than in 1996 and 414,000MT in 2005 [2].

Apart from the nutritional potentials of Shea butter, it generates income specifically for women as it is traditionally seen as women's business. Shea oil provides a major source of income to households engaged in its trade and has a higher gain when compared to other crops such as groundnut and maize [3].

In countries like (France, Great Britain, the Nether land, Denmark, North America, and Japan), Shea nut is processed in a wide range of food products including chocolate and it is becoming more popular in the cosmetic industry [4]. Niger state ranked top among the Sheanuts producing states in Nigeria which include Kwara, Nasarrawa, Zamfara, Kaduna, Sokoto, Jigawa, Kano, Plateau, Taraba, Benue, Adamawa, Bauchi, Kebbi, Edo,Yobe and Federal Capital Territory (FCT), Abuja [5].

The butter that is either traditionally or mechanically extracted from Shea nut are produced by Shea trees have a lot of end-use applications which include: valuable oil for cooking, cosmetics and skincare, pharmaceutical and medicinal uses. The oil extracted from the seeds may have up to 50% oil content and when refined, Shea oil is used as a substitute for margarine and cocoa butter in the food industries [6].

Shea butter has great economic and nutritional potentials both locally and internationally and the demand for the commodity experiencing a steady increase yearly [6]. Shea nut products command an important position in the diet of the rural people in Northern Nigeria, children, women and men eat the fruit while it is raw and the processed crude oil is also used as a food component. In most Northern villages, where cooking oil is scarce, Shea oil serves as a close substitute that is used for cooking all traditional foods [6].

Based on recent events, the interest on the Shea nut oil (Shea butter) produced from Shea nut for industrial application in food, cosmetics, pharmaceutical and traditional needs at national and international levels has increased [6].

Shea nut handling and marketing are the most challenging stages in the value chain process. There are lack of standard and quality control in the way and manner Shea nut are locally handled. The parboiling, drying, packaging and storage stages require modernization and control if high quality Shea butter/oil are to be obtained. The prices offered for Shea nut in wet and dry seasons tend to vary considerably and are usually determined by the middlemen. The established price for one tone of Shea butter varies from one season to another pending on the availability of the Shea nut during the season. Unfortunately, Shea nut production and export fall far below demand. Thus calling for an intervention to increase the supply and also improve the quality.

Vitellaria paradoxa is one of the most important sources of vegetable oil in rural areas of the savanna zone of West Africa. The bulk of the Shea nut produced are for home consumption and local trading (GIZ, 2010). Mali and Burkina Faso are other leading producers; at the end of 2005 they produced 85,000MT and 70,000MT respectively, followed by Ghana (65,000MT), Côte d'Ivoire (36,000MT), Benin (15,000MT) and Togo (8,000MT).

Up-to-date statistics on Shea nut production are not available for most countries. Reports on Burkina Faso showed a remarkable increase in production to 222,000MT in 2005. Similar trends probably took place in other West African countries. In 1998, Africa exported 56,000MT Shea nut, valued at US$ 10.5 million, of which 60% came from Ghana. Benin's exports decreased from 15,266MT in 1994 to 5,600MT in 1998, Togo had only a slight decrease from

6,562MT in 1994 to 5,100MT in 1998, whereas exports from Burkina Faso increased from 5000MT in 1994 to 7,632MT in 1997 and then to 26,600MT in 2003.The African total export for five years (1993-1997) amounted to over 48,000MT, valued at over US$ 10,000. However, no export data have been reported for Nigeria since 1995. Processed Shea butter exports in 1998 for the whole of Africa amounted to 1200MT, worth US$ 571,000.

The study is aimed to assess the quantity of Shea nut collected and processed by the processors of improved Shea nut processing technologies in Niger State. The specific objectives of the study were to; describe the socio-economic characteristics of the Shea nut processors in the study area, Determine the quantities of Shea nut/butter produced by the processors and income generated in the study area and examine the constraints faced by the processors in adopting Shea nut processing technologies in the study area.

2. METHODOLOGY

2.1 Area of Study

The study was carried out in Niger state where there are lots of wild Shea tree plantation for domestic and commercial purposes. The state falls in the guinea savannah zone and has a climate and ecological conditions that favored agricultural production. It has an annual rainfall of between 1100 mm – 1600 mm and has an average temperature of 35℃ [7]. The state has abundant wild vegetation of Shea trees and is dominated by small-scale farmers. The major crops cultivated in the State are millet, rice, maize, guinea corn, beans, cassava, groundnuts and sweet potatoes. Majority of the farmers keep livestock like poultry, goats and sheep. Others engage in crafts such as sculptures, weaving and blacksmith (Publication of Projects and Programmes Documentation Unit, PPDU, (2009). Based on the 2006 National Population Census, the state has a total projected human population of 4,250,429 as at 2006. Finally, from the existing list of 412 Shea nut processors with the state ADP), presently known and called Niger State Agricultural Mechanization and Development Agency (NAMDA), the state of Ministry Cooperatives and the Ministry Women Affairs and GIZ State Field Office in Minna, 37 percent of the processors were randomly selected. This percent of the total population was giving to obtain total sample size of 150 Shea nut processors as shown in Table 1.

2.2 Sampling Technique

In order to get a representative sample and to facilitate the achievement of the objectives of this study multistage sampling technique was adopted for the study. The first stage is the purposive selection of the state for the study because of the abundance of wild vegetation of Shea trees in the state. The second stage also involves purposive selection of Zone I based on the predominance of Shea trees [6]. Simple random sampling technique was then applied to select three (3) Local Government Areas in the zone, namely: Gbako, Katcha and Agaie.The third stage was the random selection of six (6) extension cells from each extension block making a total of eighteen (18) extension cells. From the cells a total of thirty one (31) registered Shea nut processing villages were purposively selected based on the frequency of Shea nut processing activities.

The data for the study were mainly obtained from primary. Primary data were collected from a cross-sectional survey of registered Shea nut processors through the use of an interview schedule with the assistance of trained enumerators that can communicate freely with the native language of the people in the study area.

Table 1. Distribution of sampled Shea nut processors

Extension block	Extension cells	Number of registered Shea nut processors	Number of villages selected	Numbers of processors selected
Gbako	6	118	9	43
Katcha	6	143	10	52
Agaie	6	151	12	55
Total	18	412	31	150

2.3 Instrument for Data Collection and Analytical Techniques

Descriptive statistics which include measure of central tendency, such as percentages, means and measures of variation such as variance and standard deviation were used to achieve the objectives of the study.

In testing the hypotheses, the following statistical tools were employed:

Binomial logistic regression model was used to test for significant relationship between socio-economic characteristics and processors' level of adoption of improved Shea nut processing technologies in the study area. The model was used to determine the factors that influence the adoption of improved Shea nut processing technologies. The independent variable (adoption level) was categorized into two levels on the basis of the number of technologies adopted by the processors. The processors that adopted 1 to ≤ 8 of the technologies are classified as low adopters and scored 0 while processors that adopted 9 to ≥17 technologies are classified as high adopters and scored

The binomial logistic regression model for determination of significant relationship between adoption level of Shea nut processors and the processors socio-economic characteristics is expressed as:

$$Y= \beta_o +\beta_1X_1+ \beta_2X_2 +\beta_3X_3 + \beta_4X_4+ \beta_5X_5 +\ldots\ldots\ldots\ldots\ldots\ldots \beta_nX_n \quad (1)$$

Where

Y = 1 if the adoption level of the specified improved Shea nut processing technology is high, 0 if the adoption level is low
Age(X_1)
Sex(X_2)
Education(X_3)
Household size(X_4)
Marital status(X_5)
Processing experience(X_6)
Training(X_7)
Extension contact(X_8)
Cooperative membership(X_9)
Income (X_{10})
Quantity(X_{11})

All these variables represent the vector of explanatory (independent) variables and β, are the coefficient of parameters to be estimated.

Pearson correlation coefficient was used to test the hypotheses while hypotheses three to five was tested using Pearson product moment correlation (PPMC).

3. RESULTS AND DISCUSSION

The percentage distributions of the Shea nut processors by age. The results revealed that majority (60.00%) of the processors fall within the age range of 41 – 50 years while 36.6% were 31-40 years old. The mean ages of the processors were 42.07 years. This implies that the Shea nut processors in the study area are still in their active age due to the presence many young processors (Table 2).

In addition, the percentage distribution of the Shea nut processors by gender also revealed that all (100%) of the processors were female. This implies that Shea nut processing is mainly undertaken by women.

The results of the percentage distribution of Shea nut processors by marital status showed that majority (78.00%) of the Shea nut processors were married. This implies that majority of the Shea nut processors in the study area have additional responsibilities of catering for their households (Table 2).

Although the percentage distribution of Shea nut processors by level of education showed that most of the processors had only attended adult literacy classes. This implies that processors had very low level of education. However, only educated farmers are reported to be analytical and to observe easily the obvious advantages of the technologies (Table 2).

Moreover, the percentage distribution of Shea nut processors by household size indicated that (42.67%) of the Shea nut processors had household size ranging from 11 – 15 people. Only few (3.33%) of the processors had a household size 1-5 people. This implies that majority of the Shea nut processors had large family sizes, which will provide family labour for processing (Table 2).

The percentage distribution of the Shea nut processors by processing experience. The results indicated that majority (57.34%) of the processors had more than 20 years of processing experience, and only 1.34% of the processors had less than 10 years of processing experience. This implies that the Shea nut processors in the study area had acquired enough processing experience that will encourage them to adopt improved Shea nut

processing technologies. The majority (86.00%) of the processors had contact with extension workers on the improved Shea nut processing technologies (Table 2).

Table 2. Distribution of Shea nut processors by socio-economic characteristics, number of training received, sources of credit and labour, quantity of Shea nut collected and processed into Shea butter, quantity of Shea butter per kilogram, income generated from quantity of Shea nut processed into Shea butter and constraints. (n=150)

Socio-economic characteristics, training, credit and Labour, quantity of Shea nut and butter, income and Constraints	Frequency	Percentage
Age		
31 – 40	55	36.67
41 – 50	90	60.00
51-60	5	3.33
Gender		
Female	150	100.00
Marital Status		
Married	117	78.00
Single	33	22.00
Education		
Primary	14	9.33
Secondary	8	5.55
Adult	128	85.33
Household Size		
1-5	5	3.33
6-10	61	40.67
11-15	64	42.67
Above 15	20	13.33
Processing experience		
Less than 10	2	1.34
10-20	62	41.34
Above 20	86	57.34
Extension contact		
Yes	129	86.00
No	21	24.00
Processing centre		
Yes	93	62.00
No	57	38.00
Membership of association		
Yes	123	82.00
No	27	18.00
Number of training received		
0	61	40.67
1	84	56.00
2	5	3.33
Source of credit		
Personal	44	29.33
Family	58	38.66
Friends and neighbors	48	32.00
Labour		
Family	121	80.66
Communal	27	18.00
Hired	1	0.66
Friends and neighbours	1	0.66
Quantity of Shea nut collected per processor in a year (kg)		
0 – 3000	41	27.33

Socio-economic characteristics, training, credit and Labour, quantity of Shea nut and butter, income and Constraints	Frequency	Percentage
3001 – 6000	103	61.66
Above – 6000	6	4.00
Quantity of Shea nut collected by 150 people over two years		
0 –500,000	109	72.66
501,000 – 1,000,000	40	26.67
Above – 1,000,000	1	0.67
Quantity of Shea nut Processed into Shea Butter per Processor in a Year		
0 – 500	110	73.34
1501 – 3000	39	25.99
Above – 3000	1	0.671
Quantity of Shea nut processed in a day (kg)		
0 – 40	99	66.00
41 – 80	42	28.00
Above 80	9	6.00
Quantity of Shea nut processed in a week per head		
0 – 100	88	58.00
101 – 200	88	35.33
Above 200	10	6.67
Quantity of Shea nut processed in a month per head		
0 – 200	96	64.00
201 – 400	47	31.34
Above 400	7	4.67
Quantity of Shea nut processed in a year		
0 –400	2	1.34
401 – 800	12	8.00
Above 800	136	90.66
Income generated from Shea butter in naira		
1 – 50,000	15	10.00
51,000 – 100,000	81	54.00
101,000 – 150,000	34	22.67
151,000 – 200,000	34	8.67
201,000 – 250,000	15	10.00
Above – 250,000	2	1.33
Price of Shea butter per kilogram in naira		
1 – 400	17	11.33
401 – 500	29	19.33
501 – 600	15	10.00
601 – 700	19	12.67
701 – 800	23	15.33
801 – 900	22	14.67
Above – 900	25	16.67
Constraints to technology adoption		
Insufficient Shea nut	149	99.33
Lack of credit facilities	108	72.00
Seasonality in supply of Shea nut	121	80.67
Risk associated with picking and collection	143	95.33
Problem of price fluctuation	66	56.00
Poor processing equipment	60	40.00
Poor quality of Shea butter producer	50	33.33
Poor capacity building support	95	63.33
Lack viability for commercial practicing technologies	98	65.33
Poor for organization of producers	150	100.00
Absence of sustainable policy of promoting the industry	65	43.33

Source: Field Survey, 2012

The percentage distribution of the Shea nut processors by processing centre also revealed that majority (63.00%) of the processors had processing centres. This implies that the Shea nut processors had avenues to interact and share ideas about improved Shea nut processing technologies which can facilitate the adoption of the technologies. In addition, majority (82.00%) of the processors were members of one cooperative or the other. This implies that the members stand a better chance of receiving assistance from government and nongovernmental organizations (NGOs) or donor agencies (Table 2).

The percentage distribution of the Shea nut processors by training was received. The results indicated that majority (56.00%) of the Shea nut processors had received training once, while 40.67% of the processors had no training. Only (3.33%) of the processors received the training twice. This implies that majority of the Shea nut processors had need for more training.

This also implies that if the processors did not receive training on the improved Shea nut processing technologies they would have continued to collect low quantity of Shea nut and processed low quality of Shea butter which would affect their level of income because of low patronage by the users. About 38.66% of the processors obtained credit from personal savings, while 32.60% and 29.33% of the processors obtained their credits from family and cooperative associations respectively. This implies that the processors did not patronize formal sources of credit such as commercial banks (Table 2).

The result in also Table 2 revealed that majority (80.66%) of the processors used family labour to process Shea nut while 18.00% used communal labour. Only 0.66% of the processors used hired labour. This implies that majority of the processors do not incurred extra expenses on labour.

3.1 Quantity of Shea Nut Collected by the Shea Nut Processors in the Study Area

Table 2 shows the percentage distribution of the Shea nut processors by quantity of Shea nut collected. The results revealed that majority (68.67%) of the processors collected between 3001 kg – 6000 kg. Equally, 27.33% of the processors collected between 0-3000kg in a year per processor and majority (72.66%) of the processors collected between 0-500,000 Shea nut in two years while 40% of the processors collected Shea nut of between 500,001-1,000,000 in the same number of years. The result also revealed that majority (73.34%) of the processors collected Shea nut and processed into Shea butter of between 0-1500 kg and 25.99% of the respondents processed Shea nut into Shea butter of between 1,501-3,000 kg in a year. This implies that the processors collected reasonable quantity of Shea nut per year.

3.2 Quantity of Shea Butter Processed by the Shea nut Processors in a day, wEek, Month and Year

Table 2 showed the percentage distribution by quantity of Shea butter processed by the Shea nut processors. The results indicated that majority (66.00%) of the processors processed between 0-40 kg of Shea butter in a day, while minority (6.00%) of the processors processed above 80 kg of Shea butter in a day. The results also revealed that majority (58.00%) of the processors processed between 0-100 kg of Shea butter in a week while minority (6.67%) of the processors processed above 200 kg in a week. The results also shows that majority (64.00%) of the processors processed Shea butter of between 0-200 kg in a month followed by 31.34% of the processors that processed between 2001-400 kg in a month and minority (4.67%) of the processors processed above 400 kg in a month. The result also indicated that majority (90.66%) of the processors processed above 800 kg in a year, and minority 1.3% of the processors processed between 0-400 kg in a year. This implies that the Shea nut processors were busy throughout the season with the processing technologies in the study area.

3.3 Income Generated from the Quantity of Shea Nut Processed into Shea Butter

Table 2 showed the percentage distribution of the Shea nut processors by income. The results indicated that majority (54.00%) of the processors generated between ₦51,000 – ₦100,000 per year from Shea butter processing as a business, 22.67% generated between ₦101,000 – ₦150,000 and 10.00% generated between ₦1,000 to ₦30,000 only. Equally, about 19.33% of the processors sold a kg of improved Shea butter between (₦401 – ₦500). 16.67% of

the processors sold a kg at above ₦900 and other processors at different prices as shown in the Table 2. This implies that the Shea nut processors generated large sum of money from sales of Shea nut and Shea butter and, also greatly depend on it as source of their livelihood.

3.4 Constraints Faced by the SHEA Nut Processors in the Study Area

Table 2 showed the percentage distribution of the Shea nut processors based on the constraints faced. The results indicated that majority (99.33%) of the processors had the problem of insufficient Shea nut during the peak of the dry season for processing sufficient quantity of Shea butter for commercial purposes, 72.00% of the processors complained of lack of credit facilities, while, 80.67% were faced by the constraints of seasonality in supply of Shea nut. Similarly, majority (95.33%) of the processors were faced with the constraints of risk associated with picking/collection of Shea nut, 55.00% of the processors were faced with problems of price fluctuation of Shea butter. More so, 60.00% of the processors complained of poor processing equipment while 66.67% of the processors complained of the poor quality of the Shea butter produced. On the other hand, 63.33% of the processors were faced with the constraints of poor capacity building support. Also, 63.33% of the processors complained of lack of viability commercial practicing technologies. The results also indicated that all (100%) of the processors complained of the poor for organization of producers/marketers, while 43.33% of the processors were faced with the constraints of the absence of sustainable policy for promoting the industry. This implies that the Shea nut processors were faced with numerous problems ranging from socio-economic to institutional factors.

3.5 Relationship between Socio-economic Characteristics and Processors Level of Adoption of Improved Shea Nut Processing Technologies

The hypothesis was tested using binomial logistic regression analysis at 0.05% probability level. Table 3 below shows the result of the analysis. The results revealed that membership of cooperative(X_9) marital status(X_5) and extension contact (X_8) were significant at 1% level of significance and had positive relationship with the level of adoption of improved Shea nut processing technologies. This implies that apart from easiness of access to production resources, processors that were members of cooperative organizations interact and share ideas on the advantages associated with adoption of improved Shea nut processing technologies. Similarly, marital status is a proxy of source of large household size which can serve as source of labour for the processors. Hence, Shea nut processors that are married are most likely to have more helping hands in the processing of Shea butter.

The results also show that age (X_1) was negatively significant at 0.05% probability levels with adoption of improved Shea nut processing technologies. This implies that younger Shea nut processors adopt improved Shea nut processing

Table 3. Binomial logistic regression result of adoption level and some socio-economic characteristics

Adoption level	Coefficients	Standard error	Z values	P>|Z|
Age	-.0669801**	.0367528	-1.82	0.068
Household size	-.106529	.1474022	-0.72	0.470 NS
Educational level	.0949456	.0699154	1.36	0.174 NS
Cooperative mem.	2.26534***	.6837582	3.31	0.001
Marital status	2.26534	.6837582	3.31	0.001
Processing exp.	.0315767***	.05135 4	0.61	0.539
Ext. contact	2.43678***	.4206358	5.79	0.000
Quantity proc.	-.0009725**	.0005503	-1.77	0.077
Constraints	-3.247832**	1.954347	-1.66	0.097

Source; Field survey, 2012
*N.B *= Significant at 0.10% level,*
*** = Significant at 0.05% level,*
*****Significant at 0.01%, NS=Non Significant*

Table 4. Pearson relationship between the quantity of Shea nut collected and the level of adoption of the improved Shea nut processing technologies

Variable	R	Df	P-value
Quantity of Shea nut collected	0.617	1	0.01** significant
Income realized	0.617	1	0.01** significant

Source: Field survey, 2012,
*N.B ** = Significant at 0.05 level*

technologies more than older processors as old age is associated with weakness and skepticism, while youth hood is associated with virility and venture-someness.

The results revealed that quantity (X_{11}) of Shea nut/Shea butter processed and constraints faced by the processors were positively significant at 0.05% probability levels with the level of adoption of improved Shea nut processing technologies. This implies that the quantity of Shea nut collected and processed had significant impact in their income and livelihood in terms of improving the living standard of the processors.

Furthermore, education(X_3), household size(X_4) and experience processing(X_6) were not significant even at 0.10% probability levels.

3.6 Relationship between the Quantity of Shea Nut Collected and the Level of Adoption of the Improved Shea Nut Processing Technologies

The results of Pearson analysis in Table 4 revealed that there was a relationship between the quantity of Shea nut collected and the level of adoption of improved Shea nut processing technologies. This implies that if the quantity of Shea nut collected increases, the income will also increase.

4. CONCLUSION AND RECOMMENDA-TIONS

From the study, Shea nut processing activities were mainly women business and the result revealed that the processors collected above 500,000 kg of Shea nut from the wild plantation of Shea trees in their communities and processed above 800 kg into Shea butter in a year which serves as sources of income. The study also indicated that age, processing experience and membership of association were related to adoption and statistically significant at 5% level of probability among the selected socio-economic characteristics.

Based on the findings of this study, it is recommended that Shea stakeholders in processing and marketing should interact with Nigerian Institute for Oil palm Research (NIFOR) that has the national mandate on Shea tree research and development to produce sufficient quantity of hybrid/improved Shea tree seedling varieties for modern plantation establishments.

Also, enforcement of the legislation on indiscriminate cutting down of Shea tree should be enhanced as a way of protecting the Shea trees for economic purposes.

Furthermore, organized big term marketers in the Shea industry should form and organize more associations and trainings of pickers/collectors, processors and marketers' of Shea nut/butter at the grassroots for optimal utilization of its value chains and income generation.

COMPETING INTERESTS

Authors have declared that no conflicts of interests exist.

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