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SOCIAL-ECONOMIC CHARACTERISTICS OF SHEA BUTTER PROCESSOR'S AND THEIR INFLUENCE ON SHEA WASTE GENERATION IN BOSSO LOCAL GOVERNMENT AREA OF NIGER STATE

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ABSTRACT

The socio-economic factors that influence shea butter processors can also affect the shea belt economy and livelihoods. A combination of purposive and random sampling techniques was used in selecting respondents in the study area. Data were elicited through a structured questionnaire with the Kobo Toolbox, Interviews, focus group discussions, and field observations, with 100 respondents. Analytical tools used include descriptive statistics, comprising charts, tables, and frequency distributions, with SPSS (2007) used for data analysis. The observations are that the

mean age of women involved in shea butter processing is 42 years; the majority are married women (90 %); their level of education is informal, with the majority not educated at all. The family size ranges from five to fifteen, contributing to the shea processing activities in one way or another. They have access to credit from their own shea-women processor cooperatives and other cooperatives. Most of the socio-economic factors considered have a positive influence on shea butter processors; the more the processing, the more shea residue will be generated. About 8-10 kg and 40-60 litres of Solid (Shea shell) and liquid waste (Shea Slurry) are produced daily on a large scale. Hence, the family size, age and method of processing positively influence the quantity of waste generated.

Keywords: Shea butter wastes, Age, Education, Processing methods, Livelihood,

INTRODUCTION

Vitellaria paradoxa is commonly known as the African shea tree or shea butter tree in Africa (Aidoo *et al*., 2017). Shea butter, a product of the shea tree, has many uses in cooking, cosmetics, medicine and healing (Yusuf-Salihu *et al*., 2024). Shea trees are predominantly found in African nations such as Nigeria, Ghana, Burkina Faso, Uganda, the Democratic Republic of the Congo, and Mali. They are well known for their versatility and widespread distribution. In Nigeria, Shea trees grow in the wild in various states: Niger, Nasarawa, Kebbi, Kwara, Kogi, Adamawa, Benue, Edo, Kastina, Plateau, Sokoto, Zamfara, Taraba, Borno and Oyo (Diop *et al*., 2019). The Shea butter processing industry is an increasing economic venture that serves as the principal source of income, particularly for millions of women in the African shea belt economy, as it provides direct or indirect sources of income along the value chain (Naah *et al*., 2021; Naangmenyele *et al*., 2023). According to Teketay *et al*. (2003), processing Shea butter from the Shea fruit is a labour-intensive activity, mainly carried out by women using traditional techniques; some have adopted mechanical extraction methods. The basic processes for butter extraction begin with the collection of nuts, de-pulping, drying of nuts, dehusking, drying and smoking of kernels, and pounding and grinding into a paste. Next is mixing with water, treading, kneading and churning, floating and refining, solidifying and moulding (Teketay *et al*., 2003). The traditional processing method generates significant quantities of both liquid and solid waste, which is described by Jibreel *et al.* (2013) as brown water and black sludge. The liquid fraction, according to Ofosu (2009), consists of suspended and dissolved Organic matter and oil, which may have an environmental impact. Shea waste-slurry (SWS) as used in this study refers to the

concentration of the remnant liquid (brown water) and solid (black sludge), as well as the oil at the end of the Shea butter extraction processes (Abagale *et al*., 2020).

The shea nut shell is the brownish to black, hard shell covering the kernel. It is generally disposed of into the surrounding environment in production communities, where it accumulates on receiving soils. The shea butter employs 100 % input shea kernels with an output of approximately 34.4 % shea butter, 54.3 % shea cakes, and 11.3 % wastewater (Naangmenyele *et al.,* 2023). A survey conducted by Jibreel *et al*. (2013) in the Tamale metropolis revealed that solid waste slurry is dried into a cake for further use, while almost 46 % of Shea butter processors disposed of the liquid waste on bare land. The residue from shea butter processing has been reported by several researchers as a source of organic manure, which increases the concentration levels of plant primary and secondary nutrients; influences soil pH, carbon content percentage and soil EC by increasing their levels; thus translating to plant growth and yield Abagale *et al.,* 2020). Umar (2024) reported that social institutions within rural communities, such as kinship networks, family bonds, and communal ties, play a pivotal role in shaping the livelihoods of these women. Gender relations within the shea butter value chain further influence how tasks are distributed and influence the overall socio-economic dynamics. Hence, this study investigates the socio-economic characteristics of shea butter processors vis-à-vis the quantity of waste (residue) that could be generated and recycled as organic manure for soil fertility sustainability.

MATERIALS AND METHODS

Study area

The study was conducted at the Shea Butter Processing Centre, Kodo, located between Latitudes 9.583°N and 9.650°N and Longitudes 6.500°E and 6.583°E, at an elevation of approximately 400 m above sea level, within the Bosso Local Government Area of Niger State. Niger State has two distinct seasons: the rainy season from April to October and the dry season from November to March.

Sampling procedure

A random sampling technique was adopted to obtain information from respondents. Purposive selection of the shea processing-dominated Local Government area was made because regular shea butter processing was done. Then, the Kodo village was chosen in the Bosso Local Government area. Finally, one hundred shea butter processors were randomly selected from each processing centre. Primary data were collected for the study; a semi-structured questionnaire, interviews, focus group discussions, and field observations were employed using the Kobo Collect tool. The collected data were analysed using SPSS (2007); descriptive statistics, comprising charts, tables, and frequency distributions, were used.

RESULTS AND DISCUSSION

The mean age of shea butter processors was 42 years (Figure 1), implying that the shea butter processors were mature, energetic and had the experience to handle processing activities. Ajao *et al*. (2020) reported that younger processors were open to adopting modern processing methods, while older processors relied on traditional techniques. Likewise, Sam *et al*. (2018) found that younger processors often have access to advanced training and are more receptive to adopting modern processing techniques.

The high percentage of married processors suggests that many of them likely have family responsibilities and obligations.

Figure 2 shows that 90.0 % of the shea butter processors were married, while just 9.0 % were single, and only 1.0 % are widows. This is confirmed by Umar (2024). This implies that the majority of shea butter processors had family and were likely to have labour and financial support from them. Kamga (2019) reported that 71.9 % of shea butter processors are Female, similar to Umar (2024), who reported that in Burkina Faso, women play a predominant role in shea processing due to cultural norms and historical practices.

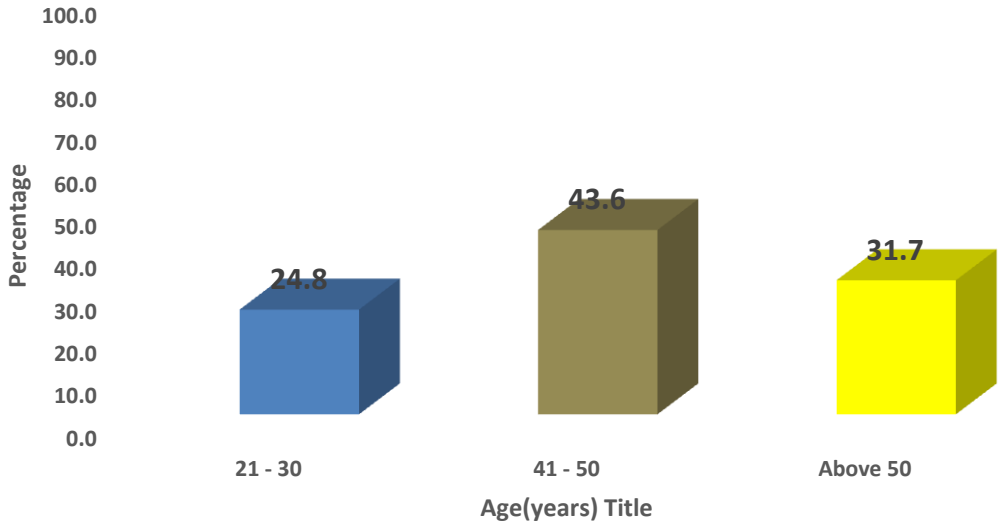

Figure 1: Age of shea butter processors

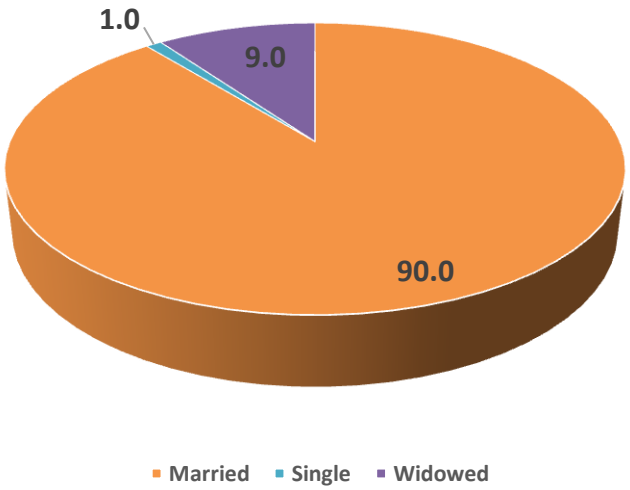

Figure 2: Marital status of shea butter processors

Table 1 presents the distribution of respondents according to socio-economic characteristics. The results reveal that the majority (73.0 %) of the shea butter processors were illiterate, with 49.0 % not having formal education but with Islamic education. The mean years of processing experience was 50 years, indicating that the shea butter processors had been in shea butter processing for as long as they understood the basic and necessary methods to achieve optimal products. This high awareness rate suggests that most processors possess the foundational skills to understand instructions, adopt new technologies, and follow proper processing methods. This long-standing engagement in the industry suggests that the processors are well-versed in traditional methods and have gained valuable knowledge over time about optimal production conditions. The combination of great awareness rates and long-term experience implies that these processors are likely capable of producing high-quality shea butter. Furthermore, Table 1 shows that the shea butter processors who considered shea butter processing their primary occupation had access to extension services and obtained credit mainly from the cooperative society. About 65.0 % of the shea butter processors had access to training on shea butter processing, and 67.0 % had access to storage facilities, which help preserve the products, thereby adding value over time. Also, at this age, they are likely to have gained significant expertise in the craft, making them efficient and knowledgeable in the best methods for processing.

Table 1: Distribution of respondents according to socio-economic characteristics

Variable	Frequency	Percentage
Level of formal education		
No formal education	23	23.0
Islamic education	49	49.0
Primary education	1	1.0
Secondary education	17	17.0
Tertiary education	10	10.0
Total	**100**	**100.0**
Years of processing		
1 – 5	1	1.0

6 – 10	17	17.0
11 – 15	16	26.0
16 – 20	13	23.0
Above 20	53	53.0
Total	**100**	**100.0**
Level of involvement in shea butter processing		
Full time	70	70.0
Part time	30	30.0
Total	**100**	**100.0**
Extension contacts		
Yes	100	100.0
No	0	0.0
Total	**100**	**100.0**
Source of credit		
Commercial bank	7	7.0
Cooperative society	93	93.0
Total	**100**	**100.0**
Training on shea butter processing		
Yes	65	65.0
No	35	35.0
Total	**100**	**100.0**
Access to storage facilities		
Yes	67	67.0
No	33	33.0
Total	**100**	**100.0**

Source: Field survey, 2024

Figure 3 shows the secondary occupation of shea butter processors. The result revealed that 49.0 % of shea butter processors engaged in trading agricultural products, farming, and other secondary occupations alongside shea butter processing. This suggests that nearly half of the respondents diversify their income sources. Figure 4 shows that the shea butter processors get information from multiple sources. However, extension agents (98 %), family and friends (95 %), and cooperative societies (61 %) are the primary and trusted sources of information for processors.

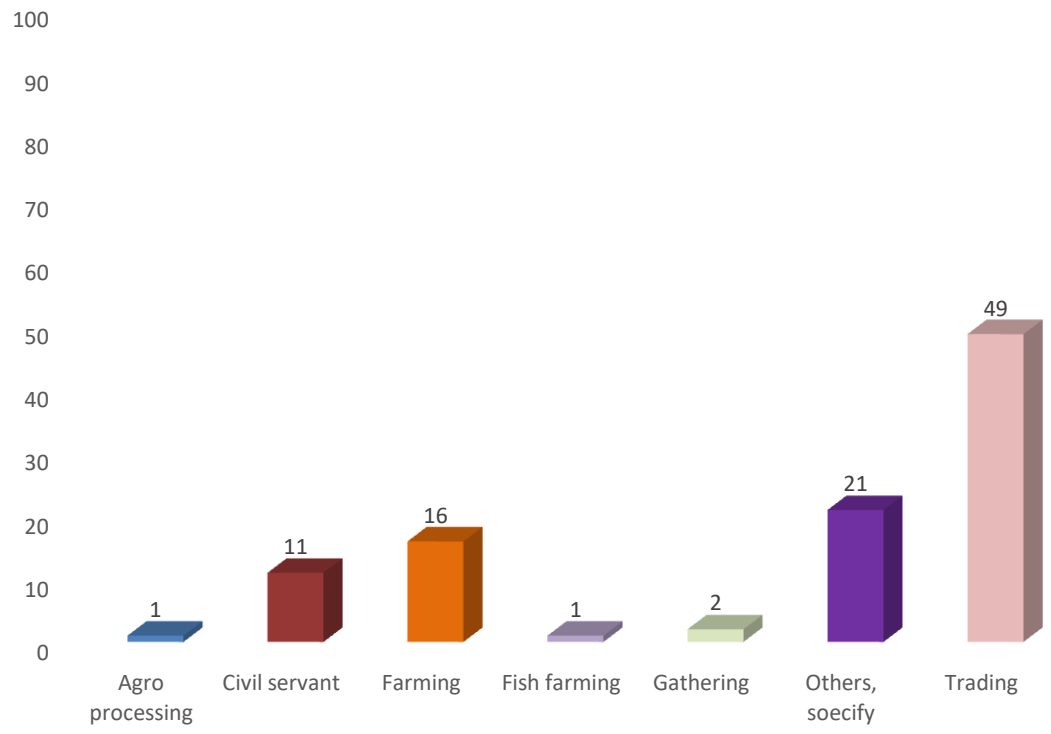

Figure 3: Secondary occupation of shea butter processors

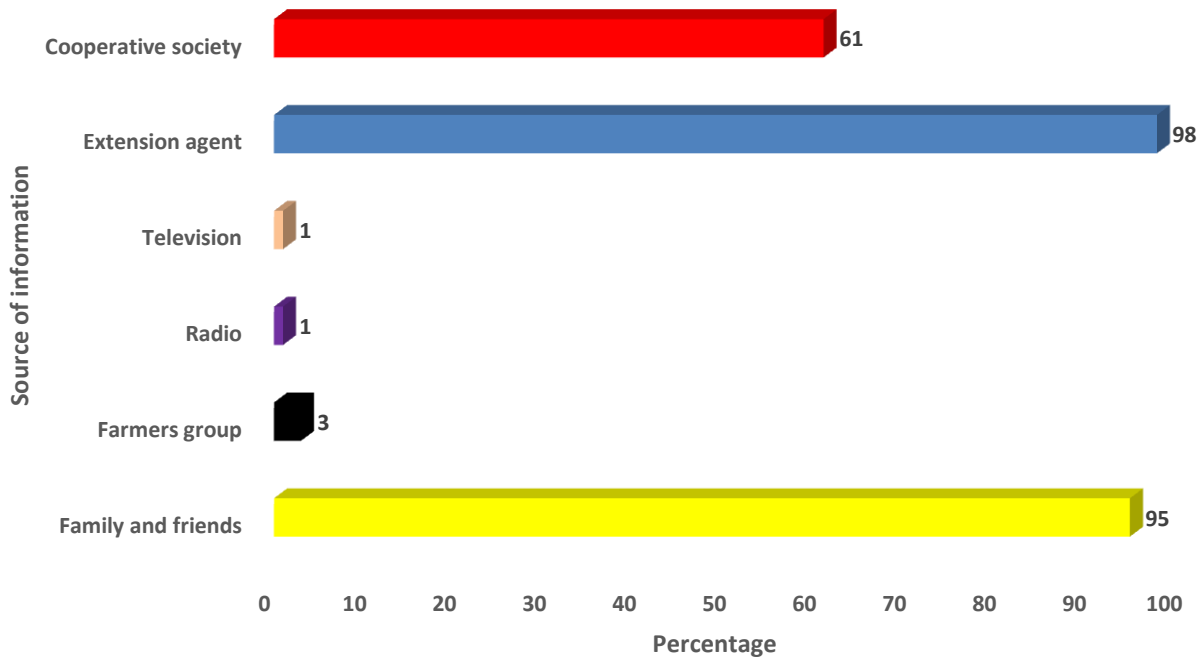

Figure 4: Source of information

Figure 5 shows that 95 % of the shea butter processors used a bowl to measure shea butter nuts, while 3.0 % used a bucket. The overwhelming preference for bowls (95 %) as a measurement tool indicates that processors are relying on traditional, informal methods. This may be due to the ease of access to bowls, which are commonly used in many local processing practices. The use of bowls as a dominant method of measurement reflects the traditional nature of shea butter processors.

The quantity of water required to process 25 kg of shea kernel is about 2.5 headloads of water bowl, which is about half the weight of the kernel. For boiling the nut, at the end of processing, the water is said to have been reduced to half the amount used at the onset, which would have been mixed with the oil. While the shea nut shell would weigh a quarter of the shea nut weight after breaking.

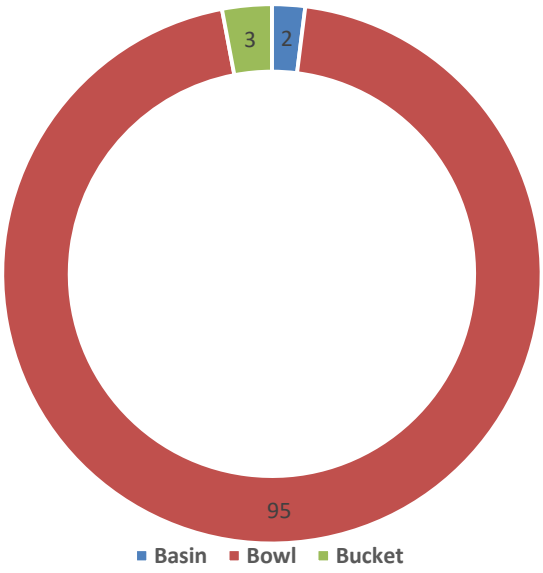

Figure 5: Method of measuring shea butter nut

Figure 6 shows that 56.0 % of the shea butter processors used both family and hired labour for processing, while 34.0 % used only family labour. The fact that over half (56.0 %) of processors use both family and hired labour suggests that many processors operate at a scale where family labour alone is insufficient to meet production demands. Hiring additional labour indicates that their operations may require more hands, either due to higher production volumes or the need for more specialized skills that family members may not have. The use of both family and hired labour can be seen as a strategy to increase productivity, especially during peak production times. It also indicates a willingness to invest in labour to boost processing capacity, potentially leading to higher output and growth, thereby increasing the quantity of residue generated.

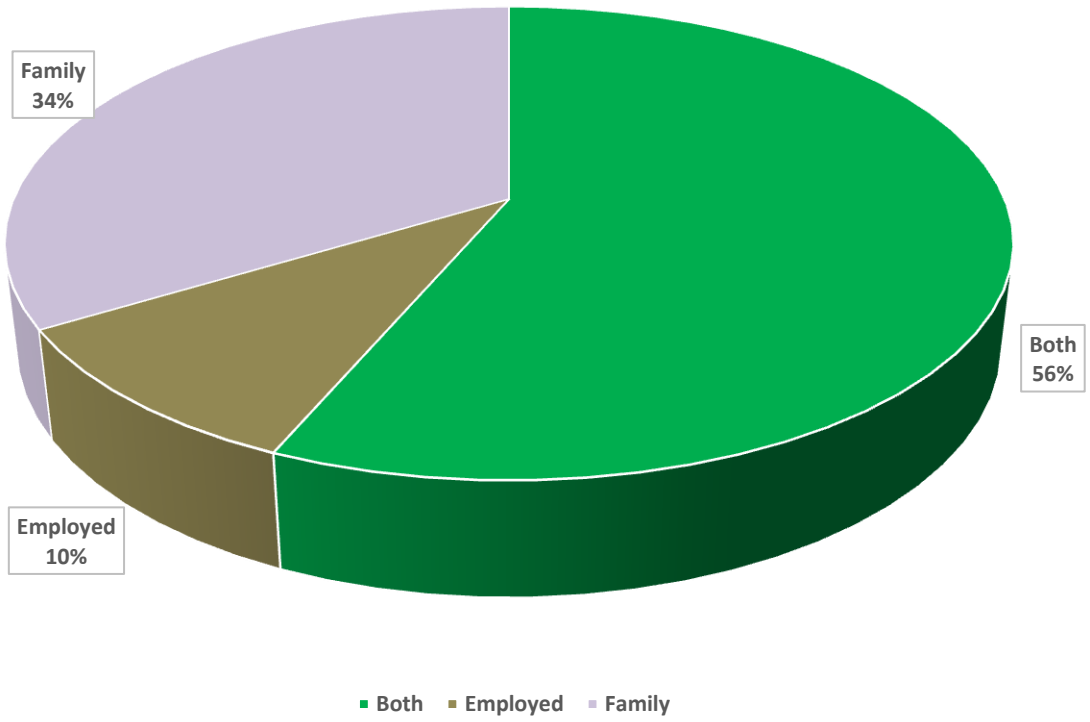

Figure 6: Type of labour used by shea butter processors

Figure 7 shows that 42.0 % of the shea butter processors stated that the shea butter production season is between May and August, while 33.0 % and 21.0 % stated that the shea butter production season is between April and August and between April and July, respectively. The majority of processors (42.0 %) identify May to August as the primary production period, which aligns with the rainy season in many West African regions where shea nuts are harvested. This indicates that most processing activities are linked to the availability of shea nuts during this period, which, in turn, affects the availability of residues.

Table 2 presents the distribution of respondents according to challenges faced by shea butter processors. The results show that the major challenges faced by the shea processors were limited access to land (4.82), inadequate credit facilities (3.97), inadequate supply of inputs (3.82), poor access to processing techniques (3.56), limited proximity to shea nut access, and low government support (3.12). Limited access to land is likely to hinder the expansion of shea nut cultivation or processing facilities. Without sufficient land, processors may struggle to source enough raw

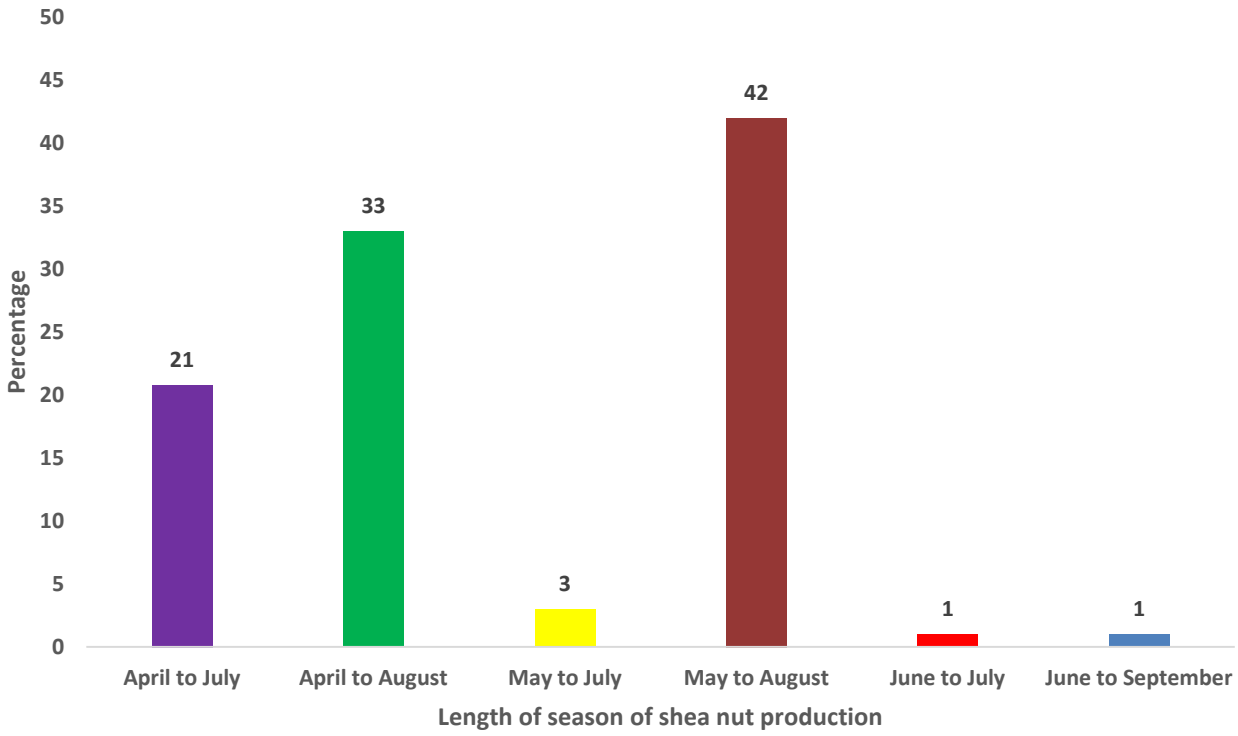

Figure 7: Length of season of shea nut production

materials or increase production capacity. Access to credit is crucial for expanding operations, purchasing equipment, or obtaining inputs. The lack of financial support limits processors' ability to invest in their businesses, reducing their potential for growth and competitiveness. The insufficient supply of inputs, such as shea nuts, packaging materials, or processing tools, affects the production process. A shortage of key inputs can disrupt the consistency and quality of the shea butter produced, as well as the quality and quantity of the residue. The lack of access to modern or efficient processing techniques reduces the quality and efficiency of production. Without adequate knowledge or technology, processors may struggle to improve product standards or meet market demands. Limited support from government agencies, whether in terms of subsidies, training, or policy initiatives, further exacerbates the challenges faced by shea butter processors. This lack of assistance may prevent processors from overcoming these structural issues or accessing new opportunities for growth.

Table 2: Distribution of respondents according to challenges faced in shea butter processors

Challenges	Not a constraint Freq(%)	Not severe Freq(%)	Slightly severe Freq(%)	Severe Freq(%)	Very severe Freq(%)	Mean
Low level of education	28(28.0)	38(38.0)	32(32.0)	1(1.0)	1(1.0)	2.09
Inadequate financial support from husband	39(39.0)	50(50.0)	7(7.0)	4(4.0)	0(0.0)	1.76
Low access to land	0(0.0)	0(0.0)	4(4.0)	10(10.0)	86(86.0)	4.82
Inadequate supply of inputs	0(0.0)	0(0.0)	25(25.0)	68(68.0)	7(7.0)	3.82
Inadequate credit facilities	0(0.0)	0(0.0)	7(7.0)	89(89.0)	4(4.0)	3.97
Limited market	0(0.0)	94(94.0)	5(5.0)	1(1.0)	0(0.0)	2.07
Low government support	0(0.0)	1(1.0)	88(88.0)	9(9.0)	2(2.0)	3.12
Discrimination against women (cultural background)	81(81.0)	17(17.0)	1(1.0)	1(1.0)	0(0.0)	1.22
Poor access to processing techniques	1(1.0)	2(2.0)	39(39.0)	56(56.0)	56(56.0)	3.56
High level of insecurity	0(0.0)	89(89.0)	8(8.0)	3(3.0)	0(0.0)	2.14
Theft	0(0.0)	43(43.0)	56(56.0)	0(0.0)	1(1.0)	2.59
Inadequate of storage facilities	2(2.0)	84(84.0)	13(13.0)	0(0.0)	1(1.0)	2.14
Unreliable sources of information on shea butter processing	0(0.0)	35(35.0)	64(64.0)	1(1.0)	0(0.0)	2.66
Inadequate capital	0(0.0)	90(90.0)	9(9.0)	0(0.0)	1(1.0)	2.12
Low level of technology	1(1.0)	22(22.0)	76(76.0)	1(1.0)	0(0.0)	2.77

Source: Field Survey, 2024

The quantity of shea butter processing waste generated, regardless of the processing method, is dependent on the quantity of shea nuts at the processor's disposal at the time of production. This study found that the peak of Shea butter production coincides with the rainy season (May – August). The more nuts to be processed, the more butter and the more waste that will be produced (Table 3). This study reveals that producers fall into different categories, ranging from small- to large-scale producers, depending on the quantity of Shea nuts they can gather daily for processing. The waste resulting from their Shea butter process ranged from 1 – 60 litres and 1 – 20 kg per day for the Shea slurry (Liquid) and shell (Solid), respectively. Most processors in the study area fall into the large-scale category, hence generating a substantial quantity of waste daily.

Table 3: Shea Butter Processing Waste Generated

Processor Category	Operational Basis (kg/day)	Liquid Waste (Liquid/day)	Solid Waste (kg/day)
Small-scale	<20	1 -12	1 – 5
Medium-scale	20-50	13 -30	6– 10
Large-scale	>50	31 - 60	11 -20

Source: Field Survey, 2024

CONCLUSION

This study found that most of the socio-economic factors considered affected participation levels, processing methods, the quantity and quality of shea butter produced, and, of course, the quantity of waste (residue) generated. The socio-economic characteristics of the women involved in shea butter processing influence shea butter production, thereby affecting the amount of shea butter waste (residue) generated at the end of each process. Therefore, the conversion of the residue into organic manure depends primarily on women's production capacity, given the circumstances of their livelihoods. Therefore, the agility, versatility, and zeal of the processors will determine the extent to

which shea butter processing will improve; the more the raw material, the more shea butter extraction, and the more waste generated for organic manure.

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REFERENCES

Abagale, F.K., Alazuga, I.N.A., & Osei, A.R. (2020). Shea waste slurry as an organic soil amendment of tropical soils in the Tamale Metropolis, Northern Ghana. Journal of Soil Science and Environmental Management, 11(3), 98-107.

Aidoo, R.P., Mensah, L.D., & Armah, F.A. (2017). Shea nut (*Vitellaria paradoxa*) processing in the Bongo District of the Upper East Region of Ghana. *Journal of Stored Products and Postharvest Research*, 8(6), 43-49.

Ajao, A., Olowokudejo, J.D., & Naidoo, Y. (2020). Socio-economic contribution of *Vitellaria paradoxa* C.F. Gaertn (Sapotaceae) to rural livelihood in Lagos State, Nigeria. *Acta Botanica Brasilica*, 34(1), 59-66.

Diop, L., Chollet, S., Dornier, M., &Reynes, M. (2019). Impact of traditional and improved processing techniques on shea butter: a review. *Food and Bioprocess Technology*, 8(3), 529-556.

Jibreel, M.B., Mumuni, E., Al-Hassan, S., & Baba, N.M. (2013). Shea butter and its processing impacts on the environment in the Tamale Metropolis of Ghana. *International Journal of Development and Sustainability*, *2*(3), 2008-2019.

Kamga, R. (2019). Effect of harvest season on shea nut yield in Niger State, Nigeria. *Agricultural Journal*, 8(2), 42-47.

Naah, A.M., Mayeem, P.B. &Osei-Himah, V., (2021). An ethnographic study on indigenous shea butter extraction and the use of the by-products. *International Journal of Research and Review*, 8 (12), 695–702. https://doi.org/10.52403/ijrr.20211284.

Naangmenyele, Z., Banye, E.Z., Bekoe, E.M.O., Zakaria, I. &Amuah, E.E.Y., (2023). Fundamentals of shea butter production; input–output analyses and profit maximization in Northern Ghana. Res. Glob. 6, 100113 https://doi.org/10.1016/j. resglo.2023.100113.

Ofosu, M.A. (2009). Anaerobic Digestion of Shea waste for energy generation (Doctoral dissertation, University of Cape Coast, Ghana). Unpublished.

Sam, H.K., Karl, P., & Kenneth, A. (2018). Assessment of knowledge levels and training needs of women shea butter processors in Northern Ghana. *Cogent Food & Agriculture*, 4(1), 439-487

Teketay, D., Gurmu, D. & Bekele, T. (2003). *Vitellaria paradoxa* subsp. nilotica, a multipurpose industrial oilseed tree: Botany, distribution, ecology and uses. Walia (23):3-18.

Umar, S.S. (2024). Effects of Shea Butter Processing on Livelihood Status of Rural Women in Niger State, Nigeria. MTech. Thesis, Department of Agricultural Extension and Rural Development, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna, Niger State, Nigeria.

Yusuf-Salihu, B.O., Lateef, A.B., & Azeez, L. (2024). Phytochemical profiling of wastes from the processing of shea butter (*Vitellaria paradoxa*) and pharmacological potentials within the paradigm of circular bioeconomy: Emphasizing antioxidant and antidiabetic applications. *Cleaner and Circular Bioeconomy Journal* 9:1-22. doi.org/10.1016/j.clcb.2024.100107.