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Investigations on the level of utilization of modern processing technologies: a case study of Shea butter processors of Oyo state

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Abstract: This study was carried out to determine the level of utilization of modern processing technologies among Shea butter processors in Oyo State, Nigeria. Specifically, the study described the socio-economic characteristics of Shea butter processors, determined the utilization index on use of Shea butter modern processing technologies and determined extent to which processors' use modern Shea butter processing practices in the study area. Multi-stage random approach was employed through interviews schedule to collect information from two hundred and twenty-eight (228) respondents. Descriptive and inferential statistics were used in data analysis. Utilization index reveals low utilization of modern technologies (53.1%) among the processors. The coefficient correlation revealed that significant relationship only existed among others between the level of use modern processing technologies and educational background (χ^2=8.934; p<0.05) and as well years of processing experiences (χ^2=7.373; p<0.05). Based on the findings, this study recommends that extension agents and other stakeholders should intensify effort to pass down adequate knowledge on the practice and advantages of utilizing modern processing technologies to Shea butter processors in the simplest form it can be well understood, to improve their perception, attitudes and as well increase their rate of utilization of modern processing technologies

Keywords: Shea butter, modern processing, technologies, utilization, Nigeria.

Introduction

Shea butter processing has been demonstrated to offer a wide range of benefits to poor rural household in Southwest Nigeria including the positive effect on their livelihoods. Based on this, stakeholders in the country both the government and non-governmental organizations have showed much interest in the shea butter industry to improve the sector. For instance, the shea butter which is extracted from Shea fruit constitutes a substantial source of income for the local populace and serves as a pool of foreign exchange for these countries in many sub-Saharan Africa regions. The collection of the Shea fruits for processing season usually happened during a period which extends from May to September annually. Therefore, there is a strong need to for a country to seek ways of maximizing the shea nut and its derivatives to earn substantial foreign exchange from the export of the nut in international market due to high demand of the shea butter as a substitute.

Notwithstanding in Nigeria, Shea tree has important, obvious and apparent role to play in her economy, but the point of question is the poor quality of the butter produced due to the method of production being employed (Ademola, *et al.*, 2012; Akinsokeji, *et al.*, 2017).

Shea butter processing in Nigeria is mostly done traditionally by women in the rural area. The procedure is quite tedious and time consuming, from collection of the Shea fruits to the production of the final product. Opportunities that abound in Shea butter processing which include income generation, poverty reduction and social welfare improvement are nowhere to be found due to traditional method of processing usually employed in the country. The method of processing is known to have direct impact on production quantity and quality of Shea butter.

The level of utilization of modern processing techniques has direct effect on the capacities of the

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processors in terms of the quality and quantity of Shea butter produced. In the words of Addaquay (2004) and Akinsokeji *et al.* (2017) relatively, the extraction rate of Shea butter from Shea nut utilizing the traditional method is around 20% while adopting semi-mechanised method is about 35% up to 40% and employing the fully mechanised method is around 42% to 50%. The crushing process, traditionally done with mortar and pestle is replaced with a hammer mill, while milling which is done using grinding stone is replaced with a modified (corn) mill that grind roasted Shea nuts into fine paste. Likewise, kneader has been fabricated to replace the traditional manual hand and pedalling kneading process (Daniel *et al*., 2005; Sanusi, *et al.*, 2016).

There are many technologies that have been developed to perform operation almost in all the different stages of the traditional method. This equipment is made up of kneader, milling machine, crusher, hydraulic press and so on. In this direction thus, Government and Non-governmental agencies have responded to the problems by devising and introducing various equipment to Shea butter processors' cooperative across the country through sensitization programmes on the benefit and the need to use modern processing technologies. This research will attempt to find reasons why some processors have not started utilizing modern technologies in the production of shea butter in Oyo State. Hence this study seeks to investigate the level of utilization of modern processing technologies: a case study of shea butter processors in the study area.

Materials and methods

Study Area

This study was conducted in Oyo State, Southwest Nigeria. The study lies between longitude 3° 47′ 34.99″E and latitude 9° 30′ 44.49″N with a total land mass of 986 km^2 and a projected population of 174,826 at 2020 using the population growth rate of the area (NPC, 2006). The state is in the forest belt zone with an annual rainfall ranging between 1000 - 1400 mm. It also endowed with vast area of fertile agricultural land, which is appropriate for crop production such as tomatoes, pepper, vegetables, melons, yam, maize, cassava, and as well for suitable for perennial crops such like cashew, shea tree etc. Most farmers in the state operate on small scale level relying on manual labour couple with using traditional method involving the use of cutlasses and hoes (Ademola *et al.*, 2012).

In terms of vegetation pattern, the Southern zone is dominated with rain forest while the Northern zone is preponderant with guinea savannah. The northern savannah zone of the state comprises of moist and dry woodland (Odebiyi *et al*., 2004). This makes Shea tree dominant in dry woodland of the state. This area is designated as Oke-Ogun which comprises of ten (10) local governments namely Saki East, Saki West Iseyin, Olorunsogo and Oorelope. The others include Iwajowa, Irepo, Atisbo, Kajola, and Itesiwaju.

Data Collection and Sampling Techniques

Data for this study was collected with the aid of interview schedule conducted with shea butter processors in the study area. Multistage sampling technique was adopted in this study. At stage one purposive selection of Oke-Ogun area in the state was selected for its notable abundance in Shea butter tree and processing. At stage two, 30% of the total numbers of Local Government in the area were purposively selected to facilitate spread and representation of all. Three (3) major Shea Butter producing Local Government Areas were selected. They are Atisbo, Iseyin and Saki West. The third stage involved 30% random selection of wards from the selected Local Government Areas. The fourth stage involved 60% random selection of processors from each ward. This gave a total sample size of 228 shea butter processors. The data obtained were analysed using descriptive statistics, such as percentage tables, chats and frequency tables. Furthermore, inferential statistics, such as chi-square test and linear regression analysis were used to test hypothesis of this study data.

Results and Discussion

Socio-economic demographics of the respondents

The socio-economic demographics of the Shea butter processors in the study area were presented in Table 1. The results revealed that 37.3% and 31.1% of the respondents were within the age range of 51 to 60 years and 41 to 50 years respectively. The average age of the respondents was 52 years. Youth were not actively involved in Shea butter processing activities; this however could be attributed to rural urban drift by the youth in search of white-collar jobs. This study is in line with Adeyemo *et al.* (2015) who indicated that the average age of the Shea butter processors in Oyo State was 56years. The table also shows that more than half (74.1%) of the respondents were females while the remaining 25.9% were males. These findings suggest that there were more males in the study area. The result also showed that most (74.1%) of the processors were female. This finding suggests that the females are

mainly engaged in the Shea butter value chain. This agrees with Abubakar *et al.* (2020) who found that 100.0% of the Shea butter value chain processors were female and this may be due to the intersection of the Shea production season with the time for agricultural production; hence the males are preoccupied with conventional farming activities.

Results from the table revealed that majority (51.3%) of the processors were Muslim, while 36.9% practiced Christianity and 11.8% were traditional worshippers. This indicates that the respondents were highly religious. As per marital status majority (64.9%) of respondents were married while only 4.8% were single. This shows that most of the respondents were married. This implies that, majority of the processors are responsible to take any rational decisions in the uptake of any innovation. This aligns with the findings of Onikoyi *et al.* (2014); Gbolagade *et al.* (2015), who reported that majority of the Shea-butter processors in Nigeria, are females who are married and opined that this might be because of female farmer's responsibility in diversifying livelihood in the rural household. Furthermore, the study also unfold that more than half (57.4%) of the respondents had household size of 4 to 6, 24.6% had between 1 and 3 while 18.0% had above 6 household size. Processing of Shea butter requires many hands, particularly the traditional processing system that is the most prevalent in the studied communities. Thus, respondents with larger household size are more able to cope with the rigor involve in processing of Shea butter due to the availability of cheap family labour while smaller household size will require more hired labour. This is almost in line with the findings of Ademola *et al.,* (2012) who indicated about 60.7% of the processors in Atisbo Local Government Area of Oyo State had between 7 to 10 household.

Table 1. Statistics of socio-economic demographics of Shea butter processors

Age	**N (%)**	**Educational background**	**N (%)**
31-40 years	32 (14.0)	Primary	76 (33.3)
41-50 years	71 (31.1)	Secondary	84 (36.8)
51-60 years	85 (37.3)	Tertiary	15 (6.6)
60 +	40 (17.5)	Non formal education	53 (23.2)
Sex		**Primary Occupation**	
Male	59 (25.9)	Farming	43 (18.9)
Female	169 (74.1)	Shea processing	150(65.8)
Religion		Artisanship	35 (15.4)
Islam	117 (51.3)	**Types of processing technologies**	
Christianity	84 (36.8)	Traditional	51 (22.4)
Traditional	27 (11.8)	Modern	10 (4.4)
Marital Status		Semi mechanized	167 (73.2)
Single	11 (4.8)	**Years of experience**	
Married	148 (64.9)	1-5	15 (6.6)
Separated	42 (18.4)	6-10	43 (18.9)
Divorced	27 (11.8)	11-15	94 (41.2)
Household size		16-20	76 (33.3)
1-3	56 (24.6)	**Sources of labour**	
4-6	131 (57.5)	Family Labour	25 (11.0)
7-9	35 (15.4)	Hired Labour	68 (29.8)
9+	6 (2.6)	Both	135 (8.4)

Source: Field study (2021)

Findings also revealed that majority of the Shea-butter processors surveyed (76.8%) had at least primary school education, while only few (23.2%) of the respondents had never been to school. This indicates that most processors can read instructional manuals. High educational levels imply that Shea butter processors could easily be trained in improved Shea-butter processing technologies. This finding agrees with Natukunda *et al.* (2011) that education stimulates the acceptance of improved technology since education facilitates adoption of innovation. The result further revealed that majority (65.8%) of the respondents had Shea butter production as their major means of livelihood. This agrees with the findings of Ibrahim *et al.* (2016) who indicated that about 95% of the processors are involved in Shea nuts processing on fulltime basis in Nigeria.

Most (73.2%) of the respondents use the semi mechanized processing method, while 22.4% use traditional processing method with only 4% used modern processing. This may be due to the fact that they have no knowledge about the modern method, and this justifies the points said earlier on that the product is unsuitable for exportation as a result of lots of

impurities and are rather consumed locally thereby fetching low income for the processors. This is in line with the findings of Ololade & Ibrahim (2014) in indicated that majority (64.4%) of the Shea butter processors in Nigeria use the traditional processing method.

The analysis showed that almost half (41.2%) had between 11 to 15 and 6.6% had 1 to 5 years of experience in Shea butter processing respectively. The experience of the respondents in shea butter processing is sufficient for a thorough understanding of the technical procedures of doing the business profitably. This result is also in line with Garba *et al.* (2015) who indicated that majority (46%) of the respondents had between 11 to 20 years of experience in Shea butter processing in Nigeria. Findings in Table 2 revealed that major sources of labour for Shea processing activities in the study area were both family and hired labour (59.2%), while 29.8% use on hired labour and 11.0% used on family labour in Shea nut processing activities. This confirms extensive use of the social form of labour in Shea nut processing activities in the study area.

Processors' utilization of modern Shea butter processing practices

Table 2 shows the extent of use of modern processing technologies in the study area. Milling of machine ($\bar{x} = 1.97$) was the most utilized processing technology and ranked 1st. This is so because milling the Shea nuts into fine paste will ensure more production of butter and can be achieved regardless of method of production (traditional or mechanized).This is closely followed by use of pre cleaner ($\bar{x} = 1.85$), crusher ($\bar{x} = 1.71$), kneader ($\bar{x} = 1.67$), screw hydraulic press ($\bar{x} = 1.50$) and expeller ($\bar{x} = 1.07$) that ranked 2nd, 3rd, 4th, 5th and 6th respectively. The utilization of these technologies can be explained from the pointed that they ensure quality and increase quantity of butter produced. The least utilized technologies were mixer ($\bar{x} = 0.99$), boiling tank ($\bar{x} = 0.34$), storage tank ($\bar{x} = 0.26$) and roaster ($\bar{x} = 0.23$) ranking 7th, 8th, 9thand 10th respectively.

Table 2. Level of utilization of modern processing technologies

Extent of use	Frequently	Occasionally	Not at all	Mean	Rank
Pre cleaner	87.3	10.5	2.2	1.85	2nd
Crusher	76.3	18.4	5.3	1.71	3rd
Expeller	35.5	36.4	28.1	1.07	6th
Screw hydraulic press	60.5	29.4	10.1	1.50	5th
Storage tank	3.5	18.9	77.6	0.26	9th
Mixer	30.3	38.6	31.1	0.99	7th
Milling machine	90.4	6.5	3.1	1.87	1st
Roaster	7.0	8.8	84.2	0.23	10th
Boiling tank	8.3	17.6	74.1	0.34	8th
Kneader	71.1	25.0	3.9	1.67	4th

Source: Field study (2021)

Table 3. Utilization index

Level of use	Frequently	Percentage	Mean	Rank
Low	121	53.1	11.50	2.32
High	107	46.9		
Total	228	100.0		

Source: Field study (2021)

The level of utilization on the overall reveals low utilization of modern technologies (53.1%) while 46.9% had high utilization of modern technologies. The result agreed with the findings of Sanusi et al., (2016) which found low utilization of modern processing technology (53.8%) in Nigeria. This can be attributed to the high cost of procuring this modern processing equipment that are aggravated by lack of credit facilities, government assistance, unavailability of modern processing technologies and poor market demand for butter.

Relationship between selected socio-economic characteristics of the respondents and their level of use modern processing technologies

Table 4 shows there was significant relationship between the level of use modern processing technologies and educational background of the respondents (χ^2=8.934; p<0.05). This implies that the higher the Shea butter processor education the higher their level of usage of modern processing technology. This is in line with the study of Egbunonu *et al.* (2019) who revealed that positive and significant relationship existed between processors' knowledge of usage of

processing technology and their years of schooling.

Table 4 shows there was significant relationship between the level of use modern processing technologies and years of processing experiences (χ^2 = 7.373; p<0.05).The significant relationship of years of experience indicated that the higher the years of experience of processors, the higher their level of use modern processing technologies. This study is in line with the findings of Koloche *et al.* (2020) who revealed that processing experience was significant at 1% level of significance and had positive relationship with the level of adoption of improved Shea nuts processing technologies.

Table 4. Chi-square analysis between the relationships between selected socio-economic characteristics of the respondents and their level of use modern processing technologies

Variables	Level of utilization		χ^2 Value	Df	p-value	Remark
	Low (%)	High (%)				
Age						
30 – 40	15 (12.4)	17 (15.9)	2.997	3	0.392	Not Significant
41 – 50	36 (29.8)	35 (32.7)				
51 – 60	44 (36.4)	41 (38.3)				
> 60	26 (21.5)	14 (13.1)				
Sex						
Male	27 (22.3)	32 (29.9)	1.707	1	0.191	Not Significant
Female	94 (77.7)	75 (70.1)				
Marital Status						
Single	7 (5.8)	4 (3.7)	5.561	3	0.135	Not Significant
Married	71 (58.7)	77 (72.0)				
Separated	24 (19.8)	18 (16.8)				
Divorced	19 (15.7)	8 (7.5)				
Educational background						
Primary education	41 (33.9)	35 (32.7)	8.934	3	0.027	Significant
Secondary education	47 (38.8)	37 (34.6)				
Tertiary education	7 (5.8)	8 (7.5)				
No Formal	26 (21.5)	27 (25.2)				
Primary occupation						
Farming	19 (15.7)	24 (22.4)	2.713	2	0.258	Not significant
Shea processing	80 (66.1)	70 (65.4)				
Artisanship	22 (18.2)	13 (12.1)				
Household size						
1 – 3	30 (24.8)	26 (24.3)	0.057	3	0.996	Not Significant
4 – 6	69 (57.0)	62 (57.9)				
7 – 9	19 (15.7)	16 (15.0)				
Above 9	3 (2.5)	3 (2.8)				
Years of experience						
1 – 5	7 (5.8)	8 (7.5)	7.373	3	0.049	Significant
6 – 10	19 (15.7)	24 (22.4)				
11 – 15	51 (42.1)	43 (40.2)				
16 – 20	44 (36.4)	32 (29.9)				

Source: Field study, (2021); Significant at $p \leq 0.05$ level

Conclusion

Based on the findings of this study it can be concluded that most of the Shea butter processors in Oyo State were getting old. Majority of the processors were not educated, married women who have been in processing for a long time with several years of experience. Besides there is a significant relationship between the levels of utilizing modern processing technologies, educational background of the respondents, years of processing experiences, perceptions of users of modern processing technologies and level use of modern technologies, sources of information (social media, extension agents and workshops & trading).

Over half of the processors had favourable perception on the utilization of Shea butter modern processing technologies. However, the level of utilization reveals low utilization of modern technologies.

Meanwhile this study recommends that extension agents and other stakeholders should intensify effort to pass down adequate knowledge on the practice and advantages of utilizing modern processing technologies to Shea butter processors in the simplest form it can be well understood, to improve their perception, attitudes and as well increase their rate of utilization of modern processing technologies.

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